



FRIDAY, SEPTEMBER 20, 1895.

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Contributions.

The Accuracy of Valve Gears.

CHICAGO, Sept. 16, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The article in your issue of last week over the signature of Digna Sequamur brings out a number of good points relating to the design of valve gears for locomotives. The writer is correct in stating that we cannot depend entirely on a valve gear as worked out on the drawing-board, and as calculated mathematically. Such drawing-room work is needed only for getting the general proportions of the details; but when an attempt is made to follow out the functions of a link valve gear, where the arrangement is not symmetrical, the subject becomes so complex that the investigation is given up before the whole truth is revealed. For this reason resort is made to valve gear models, and it is only by the use of such an apparatus that we can hope to find the wonderful possibilities of the Stephenson link motion.

I have recently seen some indicator cards from a locomotive which showed the best steam distribution I have ever observed on locomotive cards, and they were produced with an arrangement of eccentrics quite different from the ordinary practice. It is a remarkable fact that we have gone along so many years using a symmetrical arrangement of eccentrics with the link motion, and have not until recently discovered the great improvements which can be made with steam distribution by a very irregular set of eccentrics. This movement, which may be called a reform in locomotive valve gear with Stephenson link, has been worked out by changes in the locomotive itself, or on a valve gear model. The draughtsman and mathematician who have confined themselves to work on paper cannot claim any credit for the improvement. This, I think, is the principal point brought out by the writer of the article.

MECHANICAL ENGINEER.

Position Signals for Night Use.

WEST BETHLEHEM, Pa., Sept. 11, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to my letter of Jan. 3, 1895, published in your issue of the 11th, of the same month, I would like to add a word.

I did not at the time reply to the very proper criticism offered by your correspondent Q. K. in the following issue, because I was not then at liberty to disclose certain details which I afterward made the subject of an application for a patent, and which, to my mind, fully embodies the improvements suggested in that letter. If your correspondent reads this I trust he will be convinced that "stern necessity" has nothing more to do with the subject; furthermore, if he reads the article from Mr. Johnson in the next issue, Jan. 25, he doubtless discovered that his understanding that Mr. Johnson's position was dictated by "stern necessity" was quite wide of the truth.

I quite agree with Q. K. that it was "stern necessity," but Mr. Johnson, after making a rather unpleasant reference to "some people who wonder why we travel on wheels overland and on boats over the water," says: "After long experience the railroad community has adopted position and form for one condition, and a concentrated, strong light for the other." Mr. Johnson is right when he says that "after long experience the railroad community has adopted position and form for one condition." Their experience has taught them that that principle was correct, and, as he says, it has been

"adopted"; but I beg leave to submit that he is absolutely wrong when he says "a concentrated, strong light for the other" has been adopted. There is nothing of the kind. It is used from "stern necessity," but it has not been adopted. If adopted, why all the agitation of the subject? Why is Mr. Johnson so frequently on record for a change if the light has been adopted? Why is the Committee of the Association of Railroad Superintendents considering the subject if the light has been adopted? I submit, also, that he is wrong when he says it, the light, was adopted after long experience had demonstrated its superiority. Long experience had nothing to do with it. Single lights at night have been used for signals from the very inception of signaling, not because experience had anything to do with it, but because there was no other alternative.

"Stern necessity" has given us the most defective signal there is; and "stern necessity" now demands that we discard it. How it can be done, how it will be done, very shortly, follows.

I propose to place along the longitudinal center of the semaphore arm a row of incandescent electric lamps, say six, for example; connecting the lamp terminals on one side to a wire common to all; on the other side, connect each lamp terminal with an individual wire leading and connected to a stationary brush or commutator pertaining to that lamp terminal only, there being as many brushes as there are lamps; these brushes to be arranged as the stationary contacts of a commutator, around a rotating contact, or trailer, which will meet the brushes successively; preferably making contact with the one in advance just before it cuts the one next in the rear to prevent arcing of contacts.

The motive power for the rotating contact is to be a simple electro-magnet provided with a pall and ratchet wheel so that each impulse will move the commutator one step, and it is intended to revolve continuously when in action. The motive power device is small and will be attached to and carried by the blade, so as to avoid the use of any stationary wires or flexible conductors between the post and the blade except the two main wires leading on the one side to the commutating device and on the other to the wire common to all the lamps.

A switch will be placed in the circuit, so arranged that the lighting and the motors can be started from the tower. When this switch is closed the commutator will immediately be put in action and the lamps will successively be brought into circuit, one during each revolution of the commutator.

The effect upon the eye of the observer will be a streak of light running from end to end of the semaphore blade, intermittent, no matter what may be the position of the arm, whether inclined or horizontal.

The light may be white, red, green or any other color desired. My judgment would be that the colors ought to be red for home signals and green for distant; the colors to be used merely as a means of discriminating between the signals—the position to govern.

The arrangement, while producing the impression of a continuously moving streak of light, economizes current materially, as the quantity consumed will not equal that required to maintain a single constant light.

Not only is there economy in this arrangement, but also a new effect in railroad signaling. The rapid-running, intermittent streak of light, produced by the rapid movement of the commutator, makes a very much more distinctive signal than anything heretofore suggested, and will more readily attract the attention of the engine-men. The signal becomes in effect an automatic flagman to stop or start a train by movements similar to those employed by the flagman with his lantern or flag for the same purpose.

There may be some who will say this is very well so far as it goes, but what will the arrangement be where current is not available? To such I would say, there are very few important places where current at this day is not available; and at unimportant points there is usually less chance to misinterpret signals, and the necessity at such places is not so great. However, it is not by any means impossible, should any railroad wish to apply this principle to all its signals, that current could be furnished with reasonable economy for every signal.

J. W. LATTIG.

Master Car and Locomotive Painters' Convention.

The twenty-sixth annual convention of this Association was held in Cincinnati Sept. 11, 12 and 13. The admission of 24 new members made a total of 105, the largest meeting in the history of the Association. The report of the Secretary and Treasurer showed a balance on hand of \$171.72.

President Wm. T. Leopold spoke in his address of the progress being made in car painting, also of the work of the Association in the advancement of the art of painting and the advantages of a free interchange of ideas at these annual meetings.

The officers for the ensuing year are: President, Chas. E. Copp, Boston & Maine; First Vice-President, Chas. W. Mason, Pennsylvania; Second Vice-President, D. B. Vail, N. Y., L. E. & W.; Secretary and Treasurer, Robt. McKeon, N. Y., P. & O.

The first subject taken up was: What is the best material and method for interior cleaning of passenger cars that are not to be varnished inside, mild soap and water or one of the modern car renovators? In the report from the committee Mr. Keil. C. & A., said he used a soap sufficiently strong to remove the

dirt, as trying to clean cars with an oily substance is an entire failure, and when the inside is to be varnished clean thoroughly with soap water and pumice stone, then sandpaper the work before applying the varnish. Mr. Harwood, C. & O., cleans with a modern renovator when the cars are not to be varnished, but where varnishing is done he uses a mild soap with pumice stone and water.

Mr. Little, Pennsylvania, uses a mild alkaline soap and ground pumice stone. Removing dust from the inside of coaches with air under heavy pressure through a nozzle has proved itself in some cases satisfactory, but will deaden the varnish by discharging small particles of dust and dirt.

Exterior cleaning of passenger cars for revarnishing was reported on by Messrs. Hartley, of the A., T. & S. F. Railway, and Stout, of the B. & O., who favored soap and pumice stone, with plenty of water; also careful supervision of the work.

What are the cause, prevention and cure of cracks in paint and varnish? Messrs. Ritard, M. & O.; Hunnicke, M., K. & T.; and Barr, L. V., had studied the subject in all its bearings. Their reports brought out a long and earnest discussion, participated in by many members. The consensus of opinion was that cracking was caused by shrinkage of the wood. Some difference of opinion was noticed. Vibration of the wood was also advanced as a cause; proof, however, was not abundant that wood never ceased to shrink and swell, and that this was the main cause of cracking on its surface, although the painter was sometimes to blame for careless application of paint improperly prepared.

An essay by Warner Bailey, B. & M., a veteran of the car paint shop, was full of valuable suggestions to the younger members.

Papers were read by Messrs. L. E. Owen, St. L. S. W., and Henry Block, Big Four, on the best method of removing old paint from passenger cars, and if it was necessary to dress the surface by planing after it was burned off. The method generally employed is to use a gasoline lamp or gas, and it was not considered necessary to traverse or plane the surface if the burning is done by a careful man. Burning off requires .45 hours dressing up after burning 35 hours. Expense of planing and sandpapering 121 hours, making a difference of 86 hours in the cost of preparing the car for painting if planing is used.

Is it advisable to continue the use of rough stuff and block pumice stone in surfacing burned off paneled coaches? Papers were read on the subject by J. H. Worrall, B. & M., Samuel Cooper, D. L. & W., and Robt. Shore, L. S. & M. S. Each favored the continued use of rough stuff, the principal reasons being that the car cleaned up and varnished better when returned to the shop owing to there being a smoother surface; also that a car would give several years longer service without repainting. A vote was taken and carried that the use of rough stuff should be continued in surfacing burnt off paneled cars as well as on new paneled cars, as no other method had given as good results.

Painting of freight cars—the best color and material? Messrs. Binning, L. & N.; Becker, Big Four, and McKeon, N. Y., P. & O., read papers; they all agreed that a metallic paint was best and the lettering should be white. Special line cars may be painted an orange color, any shade desired and if good ochers and lead with a little venetian red are used in their composition they are fairly durable. It was decided that it is not advisable to varnish caboose cars outside.

An essay by Mr. Jas. A. Gohen, C., C. & St. L., on the present conditions and future prospects of the trade, etc., was read.

Is there any reliable substitute for linseed oil as a priming vehicle? What is your opinion of ready-prepared primers and surfacers supposed to contain little or no lead? The committee, consisting of W. O. Quest, P. & L. E.; J. A. P. Glass, Y. & M. V., and F. S. Ball, P. R. R., presented lengthy papers. Messrs. Quest and Glass had not found anything to take the place of linseed oil, although experiments were being made with substitutes that might prove good. They believed that the ready-prepared primers and surfacers were destined to become standards and were preferable to the lead and oil system. A general discussion brought out the fact that a large majority of the members favored prepared paints and were using them in their shops.

What has been your experience the last three years with a primer for iron? Have you found anything that will resist the action of rust on a locomotive tank?

Mr. James, B., N. Y. & P., offered an excellent paper on the subject. He uses crude oil and sandstone to prepare the rusty tank for the primer. After rubbing off all rust wash dry with naphtha, then coat with the primer.

Mr. Cook, P., W. & B., had found red lead the best primer for tanks. A paper was also read on the subject by J. H. Ritard, M. & O. Ry., who has discovered and is using a substance that removes both rust and scale from iron.

The exterior striping, lettering and decorating of a passenger coach. Aug. Woller, L., N. A. & C., presented a paper on the question together with designs of lettering and decoration.

This closed the subjects, and owing to the time being short the query list was laid over until next year. Wm. Garstang, Superintendent Motive Power of the Big Four Road, and John Lentz, Superintendent Motive Power of the Lehigh Valley Road, were elected honorary members by a unanimous vote of the Association.

On invitation of the "Big Four" an excursion was made

to the Barney & Smith Car Works and the Soldiers' Home, at Dayton, on Thursday afternoon. The next meeting will be in New York City on September 9, 1895.

Tests on Cylinder Condensation of the Baldwin Compound Locomotive at Purdue University.

The detail drawings of this engine were given in the *Railroad Gazette*, April 5, 1895. The apparatus was presented to Purdue University by the Baldwin Locomotive Works, and was taken from a logging engine that had been returned for alterations. Both pairs of cylinders exhaust into the same space, and have a bridge to prevent the influence of one on the back pressure of the other when running at high speed. Better results, however, would most likely be obtained with separate exhausts. The engine consists of the cylinders, valves, and all working parts, including the first pair of drivers, and is of the same size and pattern as the locomotives now in use on the Chicago & South Side Rapid Transit Co. It is of the four-cylinder non-receiver type of the Vaucrain compound.

The manner of mounting the model is in itself unique, and is a departure from the usual stationary practice. Instead of the heavy cast-iron base or bed-plate, two 15-in. channel irons are used to which the parts are attached, the channel irons being bolted securely to a heavy masonry foundation by six 1½ in. bolts. The driving axles have bronze bearings which are carried by heavy cast-iron boxes bolted to the channel irons.

The valves are of the hollow piston type, provided with packing rings, which form the edges of the valve, and the cut-off is regulated by the ordinary link motion. The high-pressure portion has ½-in. outside lap, and ⅝-in. negative lap or inside clearance. The low-pressure portion has ⅝-in. outside lap, and is line and line on the inside. The valve works in a bushing in which the ports are cut. The starting valve is actuated by a lever, which also works the cylinder cocks. With the lever in the middle position all openings are closed, and the engine works compound; but when thrown forward, the cylinder cocks on the low-pressure cylinder are open and the starting-valve turned so that the two ends of the high-pressure cylinder are in connection with each other and also with the air, thus draining the cylinders, and being in position to start. When the lever is thrown

copper band, the ends of which are fast to heavy castings, one of which is bolted to the frame of the engine, while the other is held by a large bolt and nut. Tightening up on the nut brings the band up against the pulley and furnishes the friction. A covering of rubber and canvas is outside the copper band and riveted to it

The tests were made at different steam pressures and cut-offs, the steam pressure being varied and cut-offs kept constant, and cut-offs varied and steam pressure kept constant. The tests were designated by serial numbers, so that, for example, 1-150-200 means that the test was run in the first notch off the center, boiler pressure

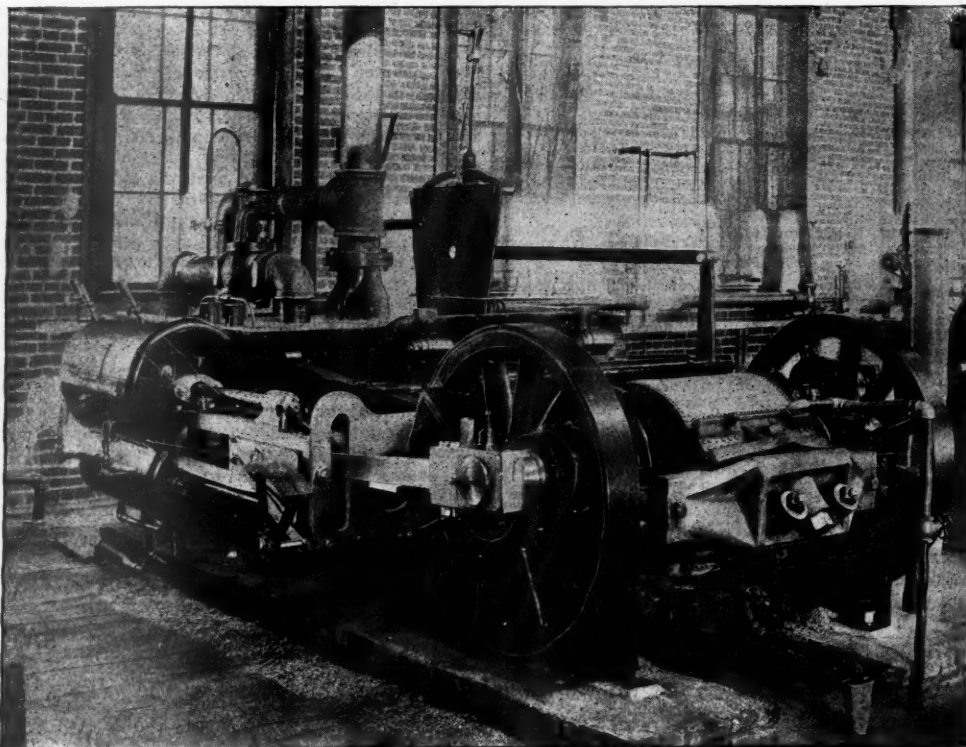


Fig. 1.—Baldwin Compound Locomotive Arranged for Tests on Cylinder Condensation at Purdue University.

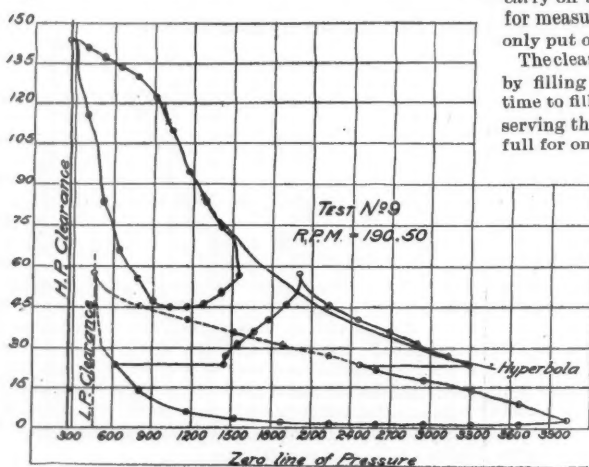


Fig. 3.

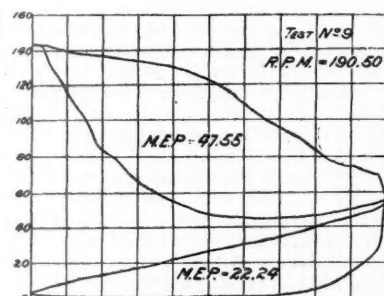


Fig. 2.

back the opening to the air is closed, and the two ends of the high-pressure cylinder are in connection, so that a start can be made with the cylinder cocks closed. The starting is all done by the low-pressure cylinder, the high-pressure piston having the same steam pressure on

the edges so that water can circulate between and carry off the heat. With this brake there is no provision for measuring the power developed, and it was, in fact, only put on until something better could be obtained.

The clearance of each cylinder was accurately measured by filling the clearance space with water, noting the time to fill and amount of water required. Then by observing the water required to keep the clearance space full for one minute the amount of leakage is determined

150 lbs., and at 200 revolutions per minute. In a similar way the other tests were designated. Only one side of the engine was used during these tests, the other being disconnected, as the boilers could not furnish steam for all four cylinders. The piston and piston-rods on the left side were removed, and cast-iron plates equal to the weight of the parts removed were bolted to the cross-head so that the running of the engine was not interfered with. Fig. 2 shows two of these cards (for test 1-150-200) drawn to the same scale of pressure. Fig. 3 shows the same cards combined according to the method proposed by Mr. George H. Barrus. This takes into account a change in volume during different periods of stroke in the low-pressure cylinder. This change is due to the fact that the clearance space is altered by the interior of the valve being sometimes in connection with the L. P. cylinder and sometimes shut off from it. It is in connection with this cylinder from the admission of steam up to the point of cut-off, and thence around to beginning of compression of another stroke there is no connection.

The results of tests are given in a tabular form below:

The column of tractive horse powers is obtained by taking 90 per cent. of the indicated horse powers, as it has been found by previous tests that the total engine friction amounts to about 10 per cent. of the total indicated horse power.

The column of draw bar pulls is obtained by multiplying the tractive horse power by 33,000 and dividing the result by the product of circumference of the wheel in feet by the number of revolutions per minute.

and the total amount of water necessary to fill the space is corrected.

Tests on this engine, when compared with those of engines on the Chicago & South Side Rapid Transit Co., will show what effect constant conditions of running

TABLE I.

Test No.	Series.	Notch off center.	Total expansion.				Boiler press.	Average R. P. M.	Miles per hour.	Average M. E. P.				M. E. P. of H. P. cyl. reduced to L. P. cyl.		Horse powers.				Total horse power.	Tractive H. P.	Draw-bar pull.	Per cent. of total H. P. developed in L. P. cyl.	Steam per H. P. per hour.
			H. E. H. and C. E. L.	C. E. H. and H. E. L.	H. E. H.	H. E. L.				C. E. H.	C. E. L.	H. E. H. to H. E. L.	C. E. H. to C. E. L.	H. E. H.	H. E. L.	C. E. H.	C. E. L.							
1....	1-90-100	1	3.55	4.42	92.3	106.69	11.65	37.83	13.82	37.87	13.41	13.33	12.95	13.02	13.49	12.45	12.92	51.88	46.69	1501	50.91	24.85		
2....	2-90-100	2	3.13	3.84	91.45	109.7	11.99	43.93	17.63	45.30	17.66	15.48	15.50	15.54	17.70	15.32	17.45	66.01	59.41	1898	53.25	24.94		
3....	10-55-100	10	2.68	2.86	84.95	137.84	15.07	35.14	13.34	36.21	13.60	12.38	12.39	15.62	16.83	15.38	16.80	64.72	58.25	1449	52.10	34.08		
4....	4-55-100	4	2.97	3.35	85.35	135.71	14.84	31.28	9.76	31.48	10.59	11.02	10.89	13.69	12.12	13.32	12.95	52.08	46.87	1184	48.14	35.81		
5....	1-55-100	1	3.55	4.42	55.30	134.35	14.69	18.00	6.16	17.90	5.58	6.34	6.12	7.89	7.57	7.41	6.75	29.53	26.58	679	48.40	34.99		
6....	3-90-100	3	2.99	3.56	88.62	141.2	16.09	44.82	17.65	46.70	18.00	15.79	16.01	21.28	23.64	21.24	23.89	90.03	81.03	1888	52.77	26.02		
7....	1-120-100	1	3.55	4.42	117.05	160.67	17.57	41.35	16.20	41.59	16.55	14.57	14.23	21.43	23.82	20.60	23.96	89.81	80.83	1512	53.20	23.62		
8....	1-120-100	1	3.55	4.42	118.40	163.69	17.90	39.99	16.99	43.10	18.04	14.09	14.74	21.11	25.45	21.75	26.60	94.91	85.42	2241	54.84	23.39		
9....	1-150-200	1	3.55	4.42	143.40	190.50	20.83	47.55	19.15	49.86	22.24	16.75	17.06	29.21	33.39	29.28	38.17	130.05	117.05	2107	55.02	22.17		
10....	1-150-100	1	3.55	4.42	137.80	148.35	16.22	50.34	20.52	51.94	23.10	17.74	17.77	24.08	27.86	23.75	30.87	106.56	95.90	2217	55.11	22.17		

each side, so that it is balanced, and does no work until the lever is moved in the middle position.

Fig. 1 is a photograph of the engine as arranged for conducting the tests. Under the present arrangement steam is supplied by a Babcock and Wilcox boiler. The steam used during the test was determined by condensing it in a surface condenser placed above the engine (but not shown in the photograph) and weighing the water in two barrels placed on platform scales.

The engine was controlled by a friction brake, shown between the drivers in Fig. 1. It consists of a wooden split pulley, 30 in. in diameter and 36 in. across the face, fixed to the axle. Around the pulley extends a

have upon engine performance, and in a limited way the value of shop tests.

The principal dimensions are as follows:

Length over all	10 ft. 5 in.
Diameter of cylinder	9½ in. and 16 in.
Stroke of piston	18 in.
Diameter of piston rod	2 in.
Length of main rod, center to center	3 ft. 10 in.
Length of steam ports	22 in.
Width of steam ports	1½ in.
Length of exhaust ports	22 in.
Width of exhaust ports	2¼ in.
Clearance H. P. cylinder H. E.	23.72 " "
" " C. E.	11.60 " "
" " L. P. " " C. E.	12.95 " "
Diameter of driver	3 ft. 6 in.

The results obtained from test 1-150-200 gave naturally the best results in water per hour per horse power, but are not as good as may rightly be expected from higher steam pressures. However, it is interesting to note that this is about 10 per cent. less than the best steam consumption of the "Schnectady," a simple 17 in. x 24 in. locomotive at Purdue University, especially when the fact is taken into account that the Baldwin locomotive model is less than half the capacity of the "Schnectady." It is scarcely fair to make a comparison of these figures with any others than those obtained from shop tests.

Analysis made of the indicator cards of each test to determine the change in the steam while passing through

the cylinders, and the amount of compensation and re-evaporation, resulted as shown in Table 2.

In making this analysis points were taken on the curve just after cut-off, before release, and after compression so as to insure the complete closure of the valve. The volumes and pressures being determined from the indicator card, the weight of steam at the several points was determined by steam tables. The steam used per stroke was taken from that shown by the condensers, allowing 1½ per cent. for priming, as it was found out previously such was the condition of steam from the boilers which ran the engine. After the weights of steam at the various points in the high and low pressure cylinders had been

any desired carbon and not go any lower, preventing over melting. The source of heat is extraneous and can be regulated at will, making it possible to produce steel of 1 per cent. carbon or more from a charge containing .10 phosphorous and yet have steel contain less than .05 phosphorous, although it be melted down only to 1 per cent. or more carbon, requiring practically no recarbonizing. This fact has given the basic open hearth an enormous field of usefulness which was not successfully occupied by Bessemer steel. The process, however, is much slower, and for a large output requires a larger investment and more skilled labor, which makes it unlikely that it will drive Bessemer steel from its own peculiar field. The process has one drawback. It is neces-

Electric Lighting of the North Land and North West.

The illustration shows the direct connected electric lighting plant such as is used on the steamers North Land and North West, of the Northern Steamship Company's line between Buffalo and Duluth. The machines were made by the Fisher Electrical Manufacturing Company, of Detroit. The engines are triple expansion, and take steam at 250 lbs. boiler pressure. The engine and dynamo bedplate are cast in one piece. The three-throw crank shaft is made from a solid steel forging, and each crank throw balances its own piston. On the end of the shaft a steel coupling is forged, which engages a similar coupling on the dynamo shaft, making it possible to remove the armature of the dynamo without interfering with the engine mechanism. The cylinders and steam chests are cast in one piece and supported above the bedplate by eight turned steel columns. The columns are braced together by Y-braces between them, and each column has angle brace extending to the front and back of the bedplate. The slides and brackets that support the valve stems in position are secured to two square steel bars supported on the rear steel columns. The cross-heads, stub ends and all bearings are made of the best gun metal. The connecting rod and the valve stem rods are made from drop forgings. All bearings are of the self-oiling type and the moving parts are lubricated by an oil-well supplying 16 drips, each drip capable of independent adjustment.

These plants were designed for use on the steamers North West and North Land, and are the only triple expansion sets now in use for marine work. The dynamo is of the multipolar type, compound wound with steel fields. The commutator is extra large and the current is supplied from two sets of carbon brushes located on top of the commutator. The speed is 300 revolutions per minute. The power is 65 H. P., and the weight total of engines and dynamo is about 10,000 lbs., or about 154 lbs. per horse power. They run the electric search light and the incandescent lamps on the steamers.

The Exhibition at Atlanta.

The extent and completeness of this exhibition, the Cotton States and International Exposition, to give its full name, which was inaugurated on Wednesday of this week, have not been generally recognized beyond the states naturally most interested in its success; but it will have a great influence on a large section of the United States, which is advancing rapidly in wealth and developed resources. It will benefit the whole district to an extent not measured by the influence such exhibitions usually have upon the country or district where they are held, and it will be of no small consequence to the whole country. An important and lasting benefit will be the

TABLE 2.

Test Numbers.	1	2	3	4	5	6	7	8	10
Water used per stroke. By condenser. lbs.....	.10717	.12503	.13336	.09780	.06409	.13262	.11004	.12612	.13271
Steam used per stroke. Allowing 1½ p. c. priming. lbs.....	.10376	.12315	.13436	.09533	.06313	.13063	.10839	.12423	.13072
Steam used per stroke. By indicator. H. P. Cyl. lbs.....	.07631	.10091	.11369	.08338	.04616	.10834	.18499	.09527	.10272
Change in steam per stroke in H. P. Cyl. up to cut-off. lbs.....	.02956	.02325	.01649	.00721	.02220	.01923	.02761	.03108	.03331
Change in steam per stroke in L. P. Cyl. up to cut-off. lbs.....	.00781	.00445	.00445	.00411	.00063	.00789	.00852	.00345	.00168
Change in steam per stroke in H. P. Cyl. up to cut-off. Per cent. of steam used.....	28.00	18.88	7.99	7.48	35.17	14.72	25.47	25.02	25.48
Change in steam per stroke in L. P. Cyl. up to cut-off. Per cent. of steam used.....	7.21	3.61	3.39	1.27	0.04	6.04	7.87	2.78	0.83
Change in steam per stroke in H. P. Cyl. cut-off to release. lbs.....	.00014	.00052	.00026	.00023	.00010	.00023	.00023	.00079	.00005
Change in steam per stroke in L. P. Cyl. cut-off to release. lbs.....	.00078	.00049	.00027	.00037	.00046	.00012	.00088	.00078	.00063
Change in steam per stroke in H. P. Cyl. cut-off to release. Per cent. of steam used.....	0.13	0.42	0.21	0.15	0.15	2.63	0.64	0.04	0.04
Change in steam per stroke in L. P. Cyl. cut-off to release. Per cent. of steam used.....	1.37	4.05	3.85	8.65	3.92	9.12	3.85	4.85	27.71
Total change in steam per stroke.....	27.71	18.04	13.45	10.33	26.41	17.06	21.59	23.31	21.42

determined, the weight of steam at compression was subtracted from that at cut-off, and this amount from that shown at the condensers. This gives the condensation at cut-off of the high pressure cylinder. The difference between the weights at cut-off and at release show the change during expansion.

The amount of steam used per stroke as shown by the indicator is the difference between the weight at release and at compression, and this will be the amount at admission to the low pressure cylinder. The same process was carried out in the calculations for that cylinder. For the purpose of making comparisons the change in the steam in per cent. of steam used per stroke is given.

The results of the work done so far on cylinder condensation show that the cut-off and boiler pressure are the principal factors, and that the effect of speed in comparison is very small. The lowest initial condensation was obtained when working in the fourth notch from the center, and was 7.48 per cent. For the first notch 25 per cent. seems to be a good average. After about the fourth notch there is a condensation at all points in both cylinders, doubtless due to the long cut-off.

More tests will be made on this model at higher steam pressure and speed that could not be obtained owing to the condition of things during the last test. There is little doubt but many interesting and important facts will be brought out in regard to cylinder condensation and curves of the same will be obtained of great practical value.

Open Hearth and Bessemer Steel.

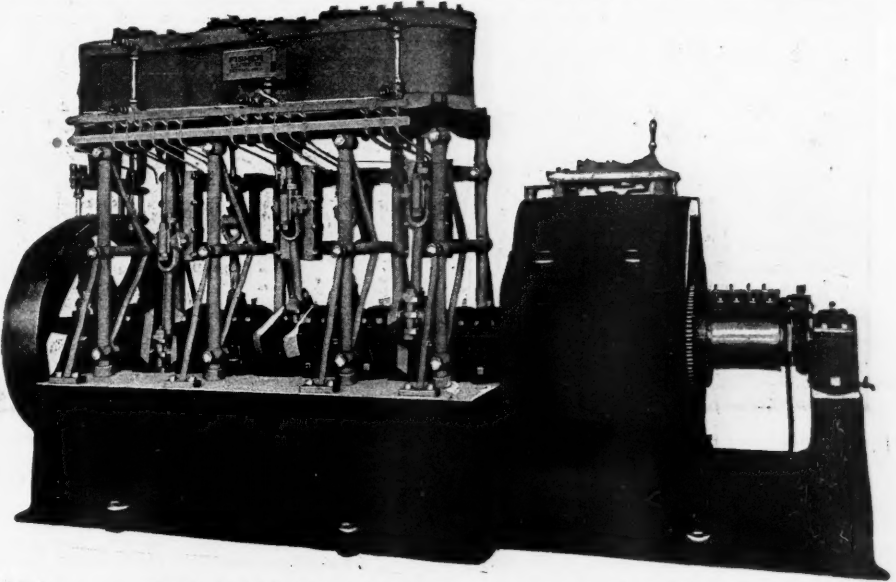
We have read with much interest an article by Mr. William Metcalf, entitled "The Revolution in Steel Making," which appears in the September number of the *Engineering Magazine*. After speaking of the invention of the Siemens regenerative furnace and of the Bessemer converter, Mr. Metcalf tells us that it is the object of his article to point out, not so much the relative merits of bessemer and open-hearth steel, as to show the different fields of usefulness for which the two are particularly applicable.

The one crowning success of Bessemer steel was, and is, the production of steel rails which resulted in the possibility of using more powerful engines and insured greater safety and less cost of road. A little later Bessemer steel began to be extensively used for all work for which iron had previously been used, but in many cases, such for instance as in boiler plate construction, numerous failures, mysterious at the time, led cautious men to be fearful of adopting the new material. The high cost of crucible steel for such work led to a search for a cheaper material, which material was found in open hearth steel. Meanwhile, Bessemer steel had almost entirely supplanted iron as a material for bridges, ship and tank plates, parts of machinery, etc., although in its earlier use it had experienced a succession of disastrous failures. However, the use of iron low in phosphorous and sulphur and high in silicon was found to overcome most of the early difficulties, while the introduction of melted ferro-manganese into the converter, after the blowing was completed was found to remove excessive and objectionable oxides tending to red-shortness. While the improved Bessemer steel was rapidly supplanting wrought iron, particularly on account of its simplicity in manufacture and cheapness, the open hearth process was establishing itself firmly, supplying excellent boiler plate sheets and all grades of mild steel for many purposes, as well as for a good quality of steel castings, strong, tough, of almost any desired shape and doing away with the weakness of cast-iron and the expense of difficult forgings.

The basic process while successful with Bessemer steel was even more so with the open hearth steel. It is possible in the basic open hearth process to melt down to

sary to start with low sulphur in the charge, this element not being reduced in the process. Mr. Metcalf hints that the reduction of sulphur is a problem upon which metallurgists may very profitably exercise their skill.

Open hearth steel is now used for armor plates, heavy ordnance, large structural shapes and heavy castings, also for common cutlery, files, cheap hatchets, good battering tools such as hammers and sledges, springs and tire of all sorts. These articles are also made from Bessemer steel, but the advantage in uniformity and strength lies with the open hearth. These articles were formerly made from German or from crucible steel, but the use of the latter has been discontinued because of its higher cost and not because the open hearth or Bessemer steels are nearly so good. The fact remains that crucible steel of chemical inferiority, but of rather high carbon, is, in the tempered condition, greatly superior to the best of Bessemer or open hearth steel, and while it is certain that there is for this a discoverable and removable chemi-



Electric Lighting Plant for the Steamers North West and North Land.

cal or physical cause, such as the presence of oxygen, nitrogen and hydrogen, all of which are introduced into Bessemer and open hearth steel in much greater quantities than into crucible steel; in what way they produce bad effects, or how they may be removed is not known. This fact points out another extensive field for future experiment and improvement.

Mr. Metcalf concludes his paper by telling us that wrought iron can never again be a leading metal of construction since mild Bessemer steel is cheaper and better. The field of crucible steel has been greatly narrowed and the open hearth process, especially the basic, has come so prominently to the front as to certainty and quality, and is so economical that it must have precedence, even though its increased cost of manufacture makes it seem likely that it will never drive out of use the cheaper Bessemer steel. Mr. Metcalf sagaciously points out that poor crucible, Bessemer and open hearth steel will always be produced in large quantities and buyers will be found for them so long as greed and ignorance are to be found among men, although there will always be men of conscience who, with a due regard for character, will always do the best work possible. The wise investor and the sensible engineer will know these latter and will feel safe in using their material.

evidence of material advancement in the South, which will be forced upon the attention of every visitor who makes intelligent use of his opportunities.

No such attempt to display the resources of the country would have been thought of or would have been possible in any of the Southern States ten years ago, and although the industrial development that has been going on in the South in recent years is a matter of general knowledge, the completeness of the change in the economical condition of the South, and the extent and diversity of industries which have been created will be a revelation to everyone not a special student of the South's progress. This development has been retarded by many adverse circumstances in the last few years, in addition to the business depression in which the whole country has shared. It now seems to be recovering faster than any other part of the country, and this recovery will undoubtedly be greatly helped by the opportunities which this exhibit will open to the South. Not the least of these will be the disposition to enter business ventures in the South which will be encouraged by the widening appreciation among the people of the whole country of the results already accomplished by the manufacturing development in the Southern states. The managers insist that the exposition is not local, and it is very true that

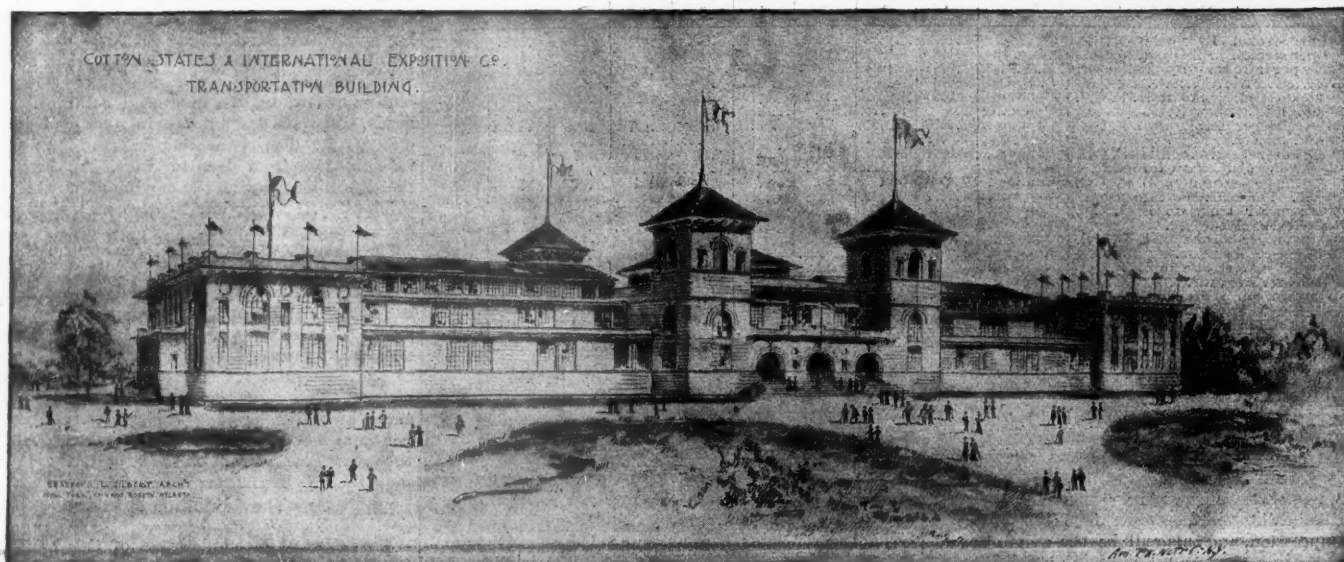
they have been successful in securing important and attractive foreign exhibits; but after all, these will merely add to the entertainment of visitors. The chief interest to the intelligent visitor must be in the products and the manufactures of the Southern states which will be seen under most favorable conditions.

When the project of having such an exposition was advanced two years ago the plans of the promoters were all on a small scale, but the success of even a small exhibition seemed to be in jeopardy by the distrust which the financial laws then on the statute books were creating and the great depression in business which followed. However, those interested acted with admirable tact and were able to secure such substantial support in Atlanta and Georgia and the neighboring states that the plans at first formulated were greatly enlarged to provide for an

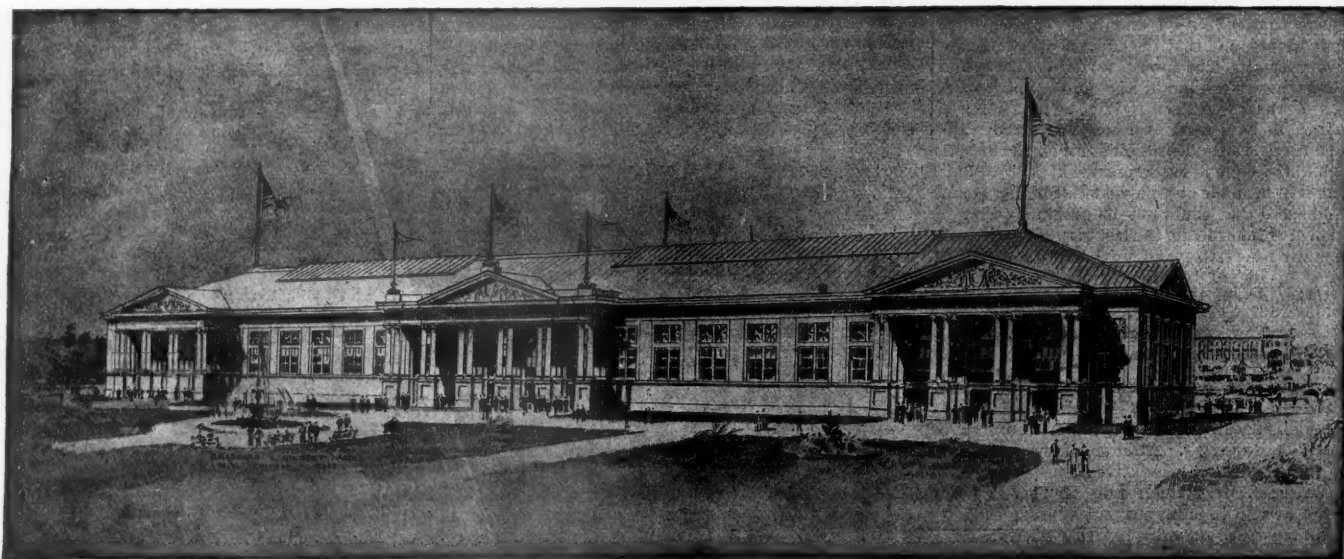
illustrations of the four larger buildings which we publish this week give no adequate idea how well he has succeeded, and of course they give no suggestion of the place of each in the whole composition.

The largest of the buildings is the Manufacturers and Liberal Arts Building, 360 ft. long, 206 ft. in width and 90 ft. high, with towers at each corner 60 ft. square. This building is provided with 20 ft. galleries running the entire length of the building, used as space for exhibits. The windows on the main floor, as well as on this gallery, are so arranged as to permit the use of the space underneath for exhibits without interfering with the light for other exhibits further away from the sides. The Transportation Building is 450 ft. long, with galleries at each end, which will be used for restaurant purposes. In an annex to this building will be space for the exhibi-

track for the four miles from the center of the city to the Exposition grounds, with terminals in the Exposition grounds and near the Union Depot in Atlanta. This double track, together with switches, is protected by half-mile electric block signals of the Hall system. The arrangement for handling the trains at both terminals is made by having three platforms: one large central platform between the double track, covered, which will hold all outgoing passengers; narrower platforms, uncovered, on the outside of both tracks, for incoming passengers. This makes it possible for outgoing passengers to enter trains on either track, not interfering with persons from incoming trains. Suitable cross-overs between the tracks make it possible for a train pulling into either terminal, to load up and go out from the same track, and relief engines will take the trains, so that the cars need not be



Transportation Building.



Machinery Building.

BUILDINGS AT THE COTTON STATES AND INTERNATIONAL EXPOSITION, ATLANTA.

MR. BRADFORD L. GILBERT, Supervising Architect.

exposition to excel any before attempted in the South. They have done much more than this.

The first important question to be decided, and one upon which the success of such exhibitions always depends to a great extent, the location of the site, was successfully solved in the selection of the Piedmont Driving Park property, on the outskirts of Atlanta, an admirably located piece of ground, 190 acres in extent, easy of access from the city, which had been previously used as the site for State fairs. This land has been admirably developed, and makes an almost ideal site, a broad expanse of sodded land with well located roads and terraces. A natural depression near the center of the tract has been made use of to form an artificial lake 13 acres in extent, which adds greatly to the landscape features of the ground and affords opportunity to group about its banks many picturesque buildings.

The plan adopted with such admirable results at the World's Fair of assigning the design of each of the important buildings to separate architects, was not followed here, the directors deciding to have the architectural scheme worked out by one architect. That decision having been reached, they made a fortunate selection, and assured the design of suitable and well-arranged buildings of agreeable architectural features by the appointment of Mr. Bradford L. Gilbert as Supervising Architect. Mr. Gilbert's long experience in the design of large buildings and railroad stations well fitted him to work out the problem assigned him. The

tion of locomotives, cars and other heavy and bulky material. The Electricity Building is one of the largest and most attractive buildings, and has an excellent location on the edge of the lake. This fact will be taken advantage of to reflect the electric lights on the outside of the building along the lake at night. Machinery Hall is 500 ft. long and 118 ft. wide.

Besides the five buildings which we illustrate, Mr. Gilbert has designed the Auditorium, the Agricultural Building, a fine structure 100 ft. high and over 300 ft. in length; the Minerals and Forestry Building, 110 ft. wide and 350 ft. long, constructed entirely of Southern woods, hickory, poplar, black gum, iron-wood, oak, maple, ash, cherry, etc., black wood and "wahoo" bark being employed for the exterior of the building; the Georgia State Building, the Fire Building, and altogether, 11 of the larger buildings. It is to be regretted that the dignity of the main Exposition buildings in many cases, as well as the general architectural effectiveness of the whole scheme, has been marred at the last moment by the overcrowding of the booths and small buildings, which the concessionaires have been allowed to erect, seemingly of any design and at any location that best suited their fancy.

The Southern is the only railroad reaching the grounds of the Exposition, and it devolved upon the company to construct a system of tracks throughout the grounds of the Exposition in order to handle all the material and exhibits, etc. The company has built a double

switched. This will make it possible for trains to move at intervals of five minutes. The cars used will be similar to those in use by the Illinois Central for handling passengers at the World's Fair. It is estimated that these arrangements will provide for handling comfortably 12,000 people in each direction an hour.

The trip from the city to the grounds and back can be made in 30 minutes, including the time allowed for loading and unloading cars. The fare will be 10 cents each way.

We can give little space to the general features of the exhibition, which are worthy of a careful description. No one who can go to Atlanta during the three months that the exhibition will be open should fail to do so. It is to be hoped that the exhibition will attract many thousands from the Northern States.

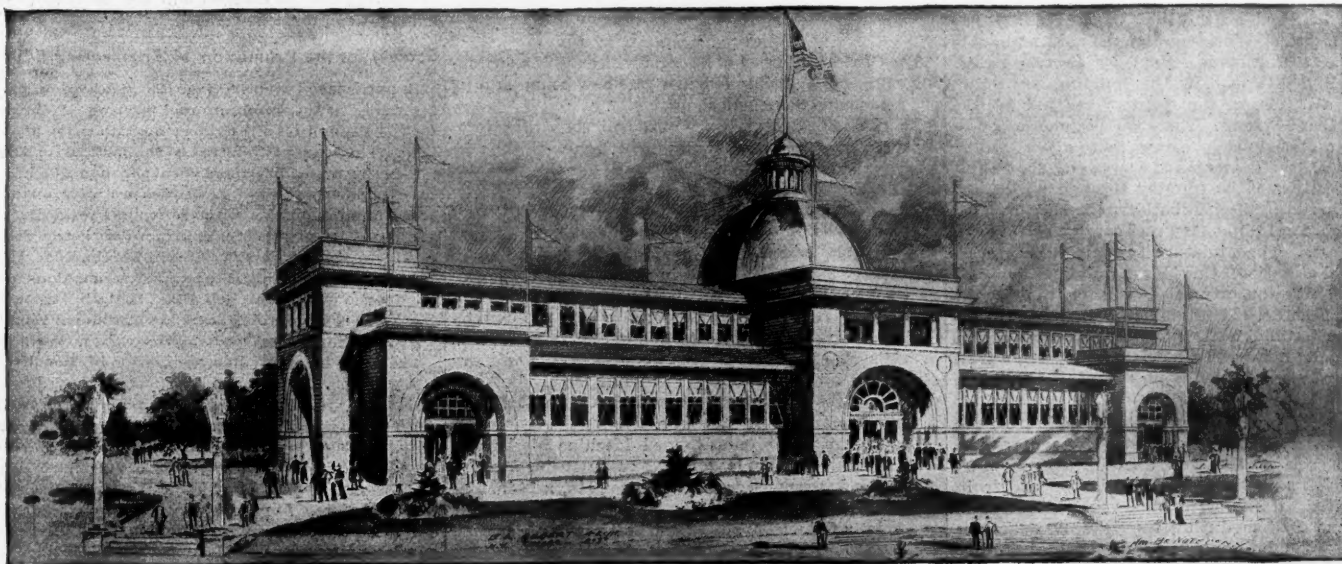
The transportation features, while containing much of interest, do not, as they certainly should, make a very large or important showing. The exhibits are scattered and incomplete, and while some fine locomotives and cars are shown by a few builders, there is no attempt at anything like a complete representation of railroad equipment or machinery. Many of the Southern railroad companies have exhibits showing the resources along their lines and some effective displays of this class have been made. The Richmond Locomotive Works, the Rogers Locomotive Works and the Baldwin Locomotive Works have engines which they have built for Southern roads on exhibition; the St. Charles Car Co. and

the Southern Iron Car Line have freight cars and the Plant System and the Southern Railway and the Pullman Car Co. have trains of passenger cars, but this about sums up the chief railroad exhibits. A large part of the Transportation building being unused for railroad exhibits, has been used for exhibits having no possible relation to transportation. Considering the importance

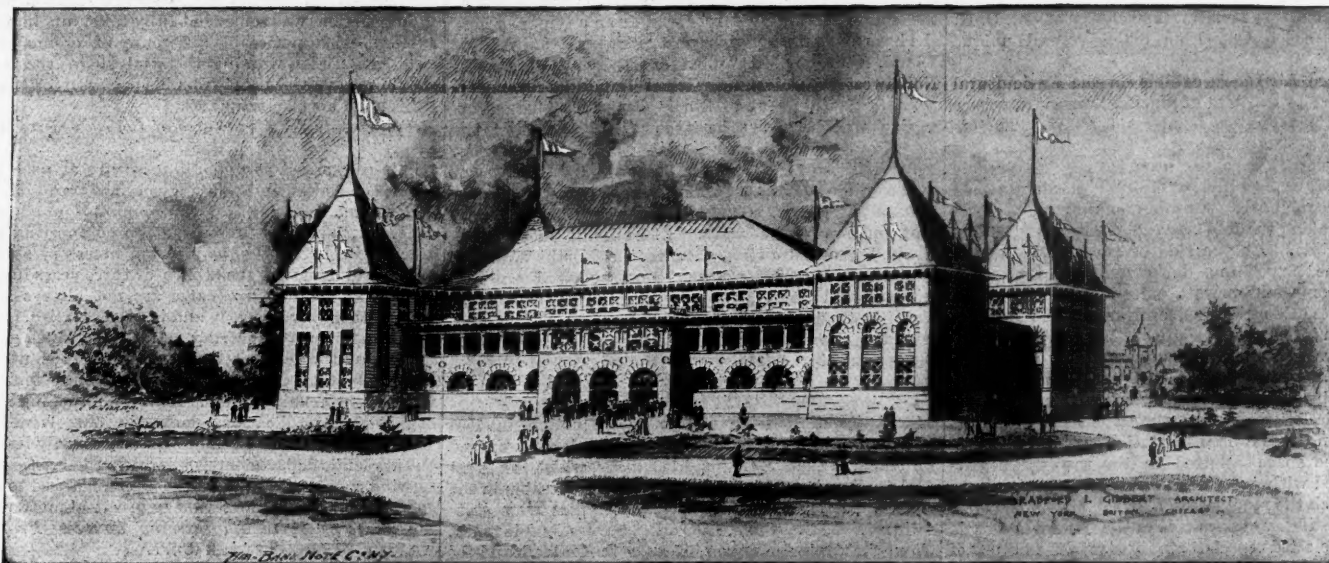
been carefully planned, and the result is attractive and valuable.

One of the most prominent of all the exhibits is that of the Southern Railway. On account of the extensive interests of the Southern in the South the ability of that road to make a fine showing is easily imagined and that it has done so is beyond question. The building erected

of Tennessee, Alabama, Mississippi and Kentucky, and is conceded to be one of the finest of its nature ever prepared. There is also a series of building stones, granites, marbles and sandstones, a collection of fruits and a collection of stuffed birds found in the territory of the Southern Railway. The agricultural exhibit contains samples of the various grains, tobacco, cotton, wool and



Electricity Building at the Atlanta Exhibition.



Manufactures and Liberal Arts Building at the Atlanta Exhibition.

of this exhibition as a whole, and the completeness of exhibits in other departments, it seems a pity that the efforts of the officers of the Transportation Department were not successful in securing a complete and satisfactory exhibit of railroad appliances.

A consideration which should have been remembered by possible exhibitors is that the Southern states will undoubtedly build a large percentage of whatever new railroad is constructed in the next few years. As in addition the Southern Railway has spent large sums, since the organization of the new company, in improvements to its roadbed and for new equipment, and while other Southern companies cannot make improvements on so large a scale as that company has been able to do, many will undertake important improvements in the next few years, replacing much of their present equipment, thus becoming very heavy buyers of railroad supplies, a desirable opportunity seems to have been lost by manufacturers of railroad appliances.

The most important additional exhibitors in this department are the Safety Car Heating & Lighting Co., the Ramapo Wheel & Foundry Company, the McKee & Fuller Company, the Standard Steel Works of Pennsylvania, the Johnson Company of Johnstown, Pa., and the Q & C Company of Chicago.

The Southern Railway and the Plant system have special buildings, and their exhibits and those of the other railroad companies represented show exhaustively the various natural and manufactured products of the sections through which their lines pass. The exhibits of this nature are elaborate, and as a whole probably better than those at the World's Fair at Chicago. It has seemed worth while to incur considerable expense in preparing these exhibits because a large number of visitors from the Northern states will go to Atlanta with some idea of removing South or to look into the possibilities of investments. The companies have, therefore, put forward in the most attractive light the many advantages to be gained from the investment of capital along their lines. There is certainly no doubt that the work has

by this company is one of the most attractive on the grounds and is situated at the entrance where the cars of the road arrive. The building is octagonal in shape, with two projecting alcoves and porches on the opposite sides. It is 43 ft. in diameter. The exterior of the building is painted white with the exception of the dome which is gilded. On the dome will be placed a figure of "Progress," holding in her hand the emblem of the Southern Railway, the letters "S.R." pierced by an arrow. This will be illuminated at night. The relief panels on the sides of the building represent the two methods of land transportation which this country has had, the stage coach and railroad trains, and there are also figures in staff representing cotton, tobacco and other products. In the interior of the building on the sides there are cabinets filled with mineral specimens, grains, etc., the center being occupied by an octagon-shaped case which surrounds the office of the agents of the land and immigration bureaus and the passenger department.

The inside of the dome of the building will be surrounded at its base with 60 electric lights, and above will be represented a map of the lines of the Southern Railway Company, and connections over which it runs through cars. The lines of the Southern will be in gold, and the principal cities will be in the form of stars. In the center of the dome, and of the map, will be a large gold star representing the city of Atlanta, the background being artistically painted in cloud effects, pink and blue. The decorations below the dome and above the cabinets are made principally of grain. The company has had an expert at work since the first of the year gathering minerals, fruits, grains, and everything showing the resources of the South, for exhibit in its building, and has spent a large sum of money in this connection. The exhibit includes an exhaustive mineral collection, which embraces samples of ores found along the lines of the Southern, and is a very attractive one, tastefully arranged. The forestry exhibit contains samples of all the commercial timbers found in the States of Virginia, North and South Carolina, Georgia, and the eastern part

of Tennessee, Alabama, Mississippi and Kentucky, and is probably the finest collection of native Southern gem stones in existence, showing that a surprising number of such stones are found in the country traversed by this road. There is also a special loan display of original black-and-white drawings, showing the evolution in modern railroad station architecture. By special request of the railroad officials these drawings were loaned by Mr. Bradford L. Gilbert, who has done as much work in this line as any other individual architect. He is the architect for the new Union Passenger Station to be erected in Atlanta by the roads entering that city. The entire display of the company is a practical one and one most pleasing in its arrangement and free from any semblance of obtrusive show.

Besides its special buildings and the exhibits which it contains, the Southern will have an exhibit in the trainshed of its fast consolidation engines for handling fast freights and fruit service; its standard 10-wheel passenger engine; latest 60-ft. postal car, built on specifications of the United States Government; latest type of passenger coach, and an improved double felt-lined ventilated fruit car. Taken altogether, the exhibit made by this company will be a highly successful one, and reflects much credit upon Mr. Baldwin, Third Vice-President of the company, who planned the exhibit, and upon those who had the arrangement of the exhibit in charge.

In this connection it might be stated that the Southern Railway Company has bought and laid, within the last 12 months, 42,000 tons of 80-lb. and 75-lb. rails, and has laid all this heavier rail on its main lines, releasing large amount of 60-lb. rail in good condition, but not sufficiently heavy for its heavier engines and the increased traffic. The released rail has been used on branch lines and has greatly improved their condition. About 200,000 yards of slag, stone and gravel ballast has been placed in the track this year.

The locomotive equipment purchased includes ten 10-wheel engines with 20-in. cylinders; twelve 19-in. switch engines, and twelve 20-in. consolidation engines for fast freight service. The cars added consist of 20

vestibuled coaches, built by Pullman, 12 baggage and express cars, 4 new postal cars, 1,000 30-ton hopper-bottom coal cars, 500 30-ton ventilated fruit cars, 200 30-ton furniture cars, 200 30-ton low-side gondolas and 50 cars specially constructed for the Exposition service.

The Plant System also has a building of its own, a unique structure in the form of a pyramid, with the four sides of the building covered with the varieties of phosphate rock found along the lines of the road. It has an elevated location. This is one of the most noticeable buildings on the grounds. Seen by electric lights, it glistens like marble. In the building are collections from all parts of the territory reached by the lines of the Plant System. There are specimens of phosphate rock, cereals, tobacco, cotton, flax, woods, fruits, cigars, pottery, earthenware and everything that illustrates the resources of the country through which the lines pass. On the north of the buildings is a shed in which is placed a train of freight cars, each car just half the size of ordinary cars. The miniature train is certain to attract unusual attention. One idea in building these cars was to afford better opportunities to visitors to study the details of equipment. The train is composed of an engine, on the headlight of which is a likeness of Mr. Henry B. Plant; a flat car, a gondola, a box car, a fruit car and a caboose. In the front end of the building there is also a model of the new steamship Florida, which is to ply between Port Tampa and Mobile. In the rear end of the building there is a turpentine still in operation. Underneath each of the cars above-mentioned there will be tablets giving the statistics of fruit, lumber, cotton, naval stores and vegetables hauled by the Plant System during the year 1895. In the rear of the main building is a hut built of Florida palmetto, and in which women will be engaged in making baskets, hats and other goods made from the palmetto. From a fountain in the building will flow water taken from Sewanee Springs, on the line of the road in Western Florida. The exhibit is in charge of Col. D. H. Elliott, who has arranged an extensive and unique collection.

The Seaboard Air Line's exhibit in the Agricultural Building also has exhibits of much interest. The space occupied by this exhibit is about 3,500 ft. The exhibit will have two entrances of massive design. One will be of North Carolina brownstone, bandsomely carved, and the other will be of Georgia granite finished in an artistic manner. The main exhibit will consist of products along the line between Atlanta and Portsmouth Virginia. At one side of the exhibit are the offices of the Exposition department of the road, reception rooms and private offices. These offices are built of selected Georgia pine, and are exceedingly attractive. An interesting feature of this exhibit is a relief map showing the entire country through which the road extends. Across the map will be run a miniature train of cars by an ingenious contrivance of pulleys.

The Georgia Railroad will make an extensive exhibit in its section in the Transportation Building. The ceiling of the space allotted to the road will be partially paneled with woods indigenous to the territory through which the road passes, and all highly polished. There will be a heavy door made of the famous Georgia curly pine, selected especially to illustrate the beauty of this pine wood. In the center of the space will be placed a pyramid of over 100 blocks of highly polished woods from the road's territory. There will also be a handsome map 14 ft. x 23 ft., which will show the various lines of the road, five principal cities, 22 towns,

county lines, names of counties, elevations above the sea and the locations of the principal colleges and schools of the state. There will also be an exhaustive collection of minerals, ores and valuable stones found along the lines of the road. An attractive part of the exhibit will be the pyramids, showing gold, iron, manganese timber, ochers and other ores. In the train shed to the east of Machinery Building there will be a train of five passenger cars.

OTHER EXHIBITS.

The Central Railroad of Georgia will exhibit a switching engine and possibly two new cars now being built at the Macon and Savannah shops.

The Baldwin Locomotive Works will show three locomotives. One of these engines will be one of the new type of passenger locomotives, built for the Atlantic Coast line.

The Pullman Palace Car Co. will exhibit the train that was on exhibition at the World's Fair, consisting of combination, baggage and smoking car "Marchena," dining car "La Rabida," sleeping car "America," compartment car "Ferdinand," parlor car "Santa Maria," and observation car "Isabella"; also send the double-decked central-entrance street car that was at the World's Fair, and a combination postal and passenger street car, the latter being something new. Detailed descriptions of these cars were published in the *Railroad Gazette* during the World's Fair.

The Richmond Locomotive and Machine Works will have on exhibition six locomotives: One 19 in. x 24 in. eight-wheel passenger engine, and one 19 in. x 24 in. ten-wheel freight engine; built for the Seaboard Air Line; one 20 in. x 24 in. compound ten-wheel passenger engine, and one 20 in. x 26 in. compound consolidation freight locomotive, built for the Southern Railway; and one 20 in. x 24 in. compound ten-wheel passenger engine, built for the Chesapeake & Ohio. The Richmond 19 in. x 24 in. compound ten-wheel engine No. 2,427 is on exhibition, the engine having just returned from a trip, in which she has run against engines on the Pennsylvania, Rock Island, Chicago, Milwaukee & St. Paul, Chicago & Northwestern, Chicago & Grand Trunk, Atchison, Topeka & Santa Fe and Illinois Central roads. This engine will be shown as it comes off the road; the others, of course, will be finished for exhibition purposes.

The exhibit of the Northern Steamship Co. will occupy a pavilion 30 ft. x 50 ft. and consists of a relief map 12 ft. x 24 ft. in size showing the Lake regions and adjacent country. On the walls will be hung photographs and water color drawings showing the North West and North Land in various stages of construction. Forming a frieze around the entire room will be hung a panoramic view illustrating types of the various craft that have plied the Great Lakes from the birch bark canoe to the present time.

Foreign Railroad Note.

Statistics of Russian railroad construction in 1893 have but recently been published. The length opened for traffic in that year was 1,128 miles, which is a great deal for Russia. This made the total in operation in the country 21,884 miles, of which 8,252 miles were state railroad. Of the whole, 4,362 miles have a double track. These figures include the 1,317 miles in Finland and the 908 of the Transcaspian Railroad, which are not usually included with the Russian railroads. At the close of 1893 work was progressing on 3,912 miles of new railroad.

The bicycle has taken Holland, and the state railroads

have had to determine what they shall do with it. Unpacked and accompanied by the rider they will take it as personal baggage for the sum of 70 Dutch cents—equals to 28 of ours. This is for any distance, but you can't go far in Holland unless you go round and round. The owner must help take it on and off the baggage car and transfer it from one train to another where such is necessary; and the railroad will not be responsible for damage to an unpacked wheel.

Society for the Promotion of Engineering Education.

In our issue of Sept. 6, page 593, appeared a preliminary report of the second annual meeting of the Society for the Promotion of Engineering Education at Springfield. The reader is referred to that article for the complete programme of papers with the names and official titles of their authors. Last week we gave an abstract of the annual address of the retiring President, Professor Swain. Our report is concluded with the following abstracts of other papers. It will be seen that these industrious gentlemen got through a tremendous number of papers. We believe it is a fact that all were read and there was considerable discussion of some of them.

Graduation Theses and Degrees—Prof. Storm Bull.

The paper is largely in continuation of the discussion last year touching degrees, or in some sense in summation. For various reasons the writer prefers a bachelor's degree in science, which corresponds in many ways with a bachelor's degree in arts. When the preparation for the engineering college requires a bachelor's degree, a professional degree of C. E. or M. E. may be suitable, but not before. In many colleges these degrees are given either for a short term of resident post graduate study, or a longer term of outside experience. A third degree of doctor of science or doctor of engineering under proper restrictions seems not objectionable. The value of the thesis and its purpose, whether to form a measure of the student's proficiency or to serve a valuable purpose in instruction was somewhat fully taken up in the discussion, with noticeable difference of opinion, as was also the question whether the student in thesis work should receive assistance from his professor or be placed entirely on his own resources.

Requirements for Graduates of Colleges—Prof. Ira N. Hollis.

It is recognized as difficult to secure at once a good general education and a special technical training. There is not much time for the acquirement of much technical detail, nor is this necessary. An engineering graduate will, in six months, acquire the necessary skill that a practical man will spend two or three years in acquiring. Engineering graduates are not always able to express themselves clearly and in good English. As preparation for the engineering college not much gain can be expected where set courses prevail, but under an elective system, perhaps three years of the four can be passed in academic courses. Academic teaching without engineering applications lacks in effectiveness, and habits of systematic work are not necessarily learned in the academic department, but are characteristic of engineering courses. Summer schools can be used to advantage in acquiring preparation in practical matters.

Graduate Study in Engineering Courses—Prof. Wm. H. Burr.

Graduate study is of two classes, first when leading to an advanced professional degree, and secondly to acquire special excellence in certain directions desired, and perhaps not leading to an advanced degree. The first class the writer finds unsatisfactory, as the work is intimately dependent upon previous imperfect course work. The latter he favors.

The Economic Element in Technical Education—Prof. L. S. Randolph.

Attention is called to the degree of refinement necessary in computation, and examples cited where results were given to fractions of a pound while the resistance of the material was known to perhaps the nearest 100 lbs. only; also, where great precision in a formula would result in a key whose practical shop dimension would be perhaps taken to nearest $\frac{1}{16}$ in. Many formulas are thus unnecessarily complex. In all such matters the commercial or economic side of the question is all important, and the student should so understand it. Economy of labor in a piece is often as important as economy of material. Students should understand methods of determining cost of machines or pieces of work.

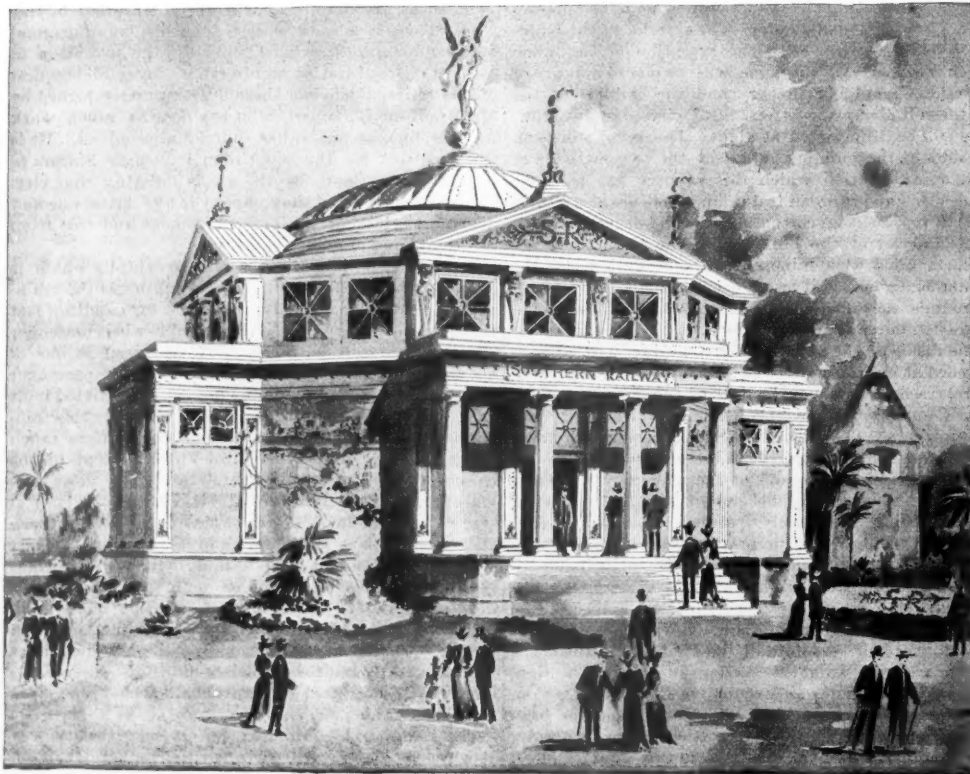
Specialization—Prof. F. R. Hutton.

The paper considers the advantages of two methods of organization in engineering schools: First, into general departments, as mathematics, physics, chemistry, where students in all courses meet the same instructors; or second, in courses where civil engineering students or mechanical engineering students will be assigned to special and different instructors.

The second or course method finds favor with the writer as the applications of the instruction may be made to meet the special needs of students. The centralization of authority in the head of the course prevents the departments from having undue effect upon students under them, by virtue of the strength of the head of that department. The strength of a course will depend more largely upon industrial conditions and the demand for engineers in any special line.

The Engineer of the Twentieth Century—E. L. Corthell.

The paper is substantially a plea for a liberal education for engineers. The writer, in support of his position, quotes freely from the address of President Morison to the American Society of Civil Engineers, from Professor Burr's paper before this educational society, from President Dwight, of Yale College, from Bishop Potter



The Southern Railway Building at the Atlanta Exhibition.

Bishop Vincent, Chauncy M. Depew, and also cites his own experience.

He advocates first a liberal education, perhaps in Latin or Greek, rhetoric, logic, science and philosophy, history, etc., to be supplemented by the technical engineering training, and believes that the man so educated will, in five years after graduation, be in advance of all others less completely educated.

The discussion showed a general endorsement as to the value of an extended education. A question was raised as to whether two years of college and four of engineering would not be better than four of college and two of engineering.

A Course in Mechanics—Prof. R. S. Woodward.

The writer discusses the order in which such subjects may be best taken up as statics, dynamics, kinematics, etc., or under similar but differing classifications. He dwells upon the necessity for appropriate problems to aid in fixing principles. He believes that students may profitably be led on to understand planetary motion to an extent that will open to view the whole territory of mechanics. His reference to the units to be used provoked a long and somewhat profitless discussion inasmuch as nobody seems converted from his old point of view. The writer thought some historical reference to the scientists connected with various theories, or discoveries would lead to investing with some life, parts of a study often made dry and uninteresting.

A Course in Astronomy—Prof. G. C. Comstock.

For a brief course to follow surveying, the purposes should be to train the student:

- In precision by the use of suitable instruments.
- In computing.
- By these means to determine time, latitude, azimuth, with creditable precision, by using ordinary engineering instruments.

Fifty or sixty exercises will serve this purpose, further work being made elective. The paper outlines such courses.

A Course in Biological Sciences—Prof. C. W. Hall.

Of three groups of studies in engineering colleges—preparatory, culture, technical—biology belongs to the culture group, although sometimes closely allied to the technical; and the attention given to it depends upon personal as well as educational considerations. A course in biology is not a course in zoology or botany, or in laboratory dissection or histology, or embryological investigation, but rather instruction in the laws of life, the relationship of all living things, and the influence of their own physical and intellectual processes. A daily exercise during one term will suffice.

Subjects Treated and Time Given.—Prof. C. L. Crandall.

The writer recognizes that many solutions of this problem have been reached in different colleges, dependent in part on environment and in part to individual preferences on the part of those in control. A schedule of studies is given with the time allotted to each, not as a perfected course, but rather as something definite to talk about and from which to reach desired results.

A Course in Sanitary Engineering.—Chas. C. Brown.

The writer regards sanitary engineering as covering all operations tending to improve the sanitary conditions of cities and country; he includes paving with subjects generally accepted as sanitary. Heating and ventilation he would leave with architects, but bridge building he includes in his subject. He believes in a thorough training in general engineering, to be supplemented by special study of sanitary engineering, and would even prefer two years of liberal training, and to this added four years of engineering study. One year of strictly sanitary work added to a complete general course in engineering would serve well. In the discussion the claims of biology and chemistry were urged but in a course so limited in extent that little more would be done than educate the student to appreciate processes and methods in those subjects rather than use them.

Geodetic Engineering—Professor Mansfield Merriman.

The writer opposes a few years' course in geodesy as unnecessary and unwise. He thinks specialization has already been carried too far. An engineer's elementary training should be broad. Geodesy should occupy an important part in any course in civil engineering; it demands mathematical perception, skill in measurement and accuracy in computation. His paper dwells upon importance of training in the theory of errors, both of instruments and of observation. He notes that angle measurements may be satisfactorily made with ordinary transit for much geodetic field work.

A Course in Mechanical Engineering—Prof. H. W. Spangler.

The details of the course will depend on the personality of the responsible head, and also upon the industries to be supplied, as well as the preparation of the students. Specialty in instruction is less important than laying a broad engineering foundation. In commenting upon preparatory studies, he regards commenting upon preparatory studies, he regards physical laboratory as practice in manipulation and observation, rather than properly a study of physics. Chemistry should include quantitative determination of engineering materials. In hydro, thermo, electro-dynamics, including laboratory work, it is not the number of experiments but the amount of thinking necessary that counts. What specialties are taught is less important than that the Professor is familiar with the special subject taught.

Industrial Application of Electricity—Prof. Geo. D. Shephardson.

After the engineering student has his foundation of physics in the lower years, he should learn something of the directions in which electricity is being developed commercially; this may include the steps of development; present state of the case as shown by size, location and cost of plants. The aim should be to enlarge the vision, to pass from the few cases in the knowledge of the student, to a view of the field generally, in every direction, and to show that much has been learned and much remains as yet unknown. The opportunities for a student can thus be shown, and is aided in choosing the special line of work to be followed.

Mining Engineering—Prof. Regis Chauvenet.

The writer thinks the location of a mining school more important than its equipment; it tends to create an atmosphere which favors the acquirement of knowledge. The foundation courses of mathematics, chemistry, mineralogy and drafting are noted. In the paper and its discussion, the necessity for both civil and mechanical engineering training, and of metallurgy, are recognized and the impossibility of suitably covering these parts of the subject in a four years' course is pointed out. Special courses in the Colorado College proved a source of weakness rather than strength, as has often been the case in mining courses. In the Discussion it was claimed that in many ways equipment was more important than locality; metallurgical laboratories, for instance, are necessary even in a mining region.

Mining and Metallurgical Laboratories—Prof. H. O. Hofman.

The first laboratory for these uses in this country was put in operation in 1871 at the Massachusetts Institute of Technology. They are considered essential and are commonly provided, and provide specially for mechanical concentration and metallurgy. Mining must be taught in the field and the summer mining school (due first to Columbia School of Mines) is the recognized method. Laboratory apparatus must allow examination of materials after every step. A plant suited specially for testing, rather than an example of commercial plants is considered preferable. The laboratories of the Massachusetts Institute of Technology are described in some detail. The paper is also printed in the Transactions of the American Institute of Mining Engineers.

Engineering Materials—Prof. J. B. Johnson.

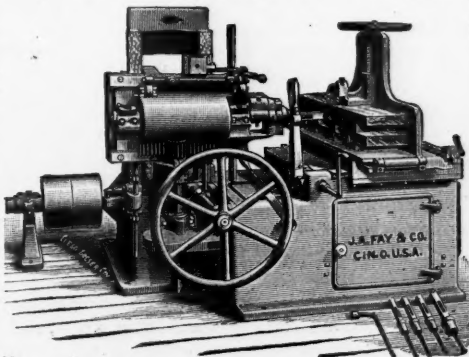
Such a course should embrace:

- A review of the principles of mechanics with special reference to this subject.
- A description of testing machines and methods of testing from the machines if possible, otherwise by written descriptions; all this before tests are entered upon.
- A classification of ordinary engineering materials, with methods of their manufacture should accompany the laboratory course.
- Laboratory tests by students in squads of three or four, under competent instruction. Results should be fully worked up.

The materials tested should include stone, brick, cement, wood, iron and steel of various grades. All measurements, placing, testing and computations, should be students' work and in duplicate by two students.

An Improved Mortising and Boring Machine.

The J. A. Fay & Egan Co., of 284 to 304 Front street, Cincinnati, O., have introduced a new machine for mortising all kinds of heavy timbers used in car and bridge construction, which we illustrate herewith. The machine is operated by the reciprocation of a square, hollow chisel having an auger revolving in its center. The chisel thus squares the hole made by the auger. No cleaning out of the hole is necessary after the mortise is made, and a mortise of any length can be completed by



Improved Mortising and Boring Machine.

continuously cutting one hole after another on the same line. The reciprocation of the chisel is automatic.

The heavy bed which supports the timbers has adjustments for carrying it to and from the chisel for varying thicknesses of material and depths of mortise. It is movable endwise to produce varying lengths of mortise. There is a clamping arrangement provided for holding the material in position; also stops for gaging the lengths of mortises and for using templates in producing duplicate mortises.

The chisel frame and auger spindle are carried on a heavy vertical column connected to the base on which

the bed for the timber is placed. It has a vertical movement on the column to vary the position of the chisel. Stops regulate the height of travel of the chisel frame, it being moved by means of a large hand wheel. The reciprocating motion of the chisel frame is produced by a reversing friction and gearing which operates in a rack on the chisel frame. The reversing friction is operated by a trip on the chisel frame support moved by dogs on the chisel frame which are adjustable for varying distances of travel of the chisel. The machine can be used for single and double mortising, for gaining, counter-sinking, end tenoning and boxing. The chisel has a travel of 10 in. in depth and the vertical range of work is 13 in. Mortises can be made up to $2\frac{1}{2}$ in. square. The table will receive material $15\frac{1}{2}$ in. high. Chisels $\frac{1}{4}$ in., $\frac{1}{2}$ in., 1 in., $1\frac{1}{2}$ in. and $2\frac{1}{2}$ in. are provided with their augers. The tight and loose pulleys are 12 x 6 in., and should make 1,000 revolutions. The counter shaft is attached to the machine, driving the reversing friction by two belts, and a belt to the auger spindle over a pair of idlers, one of which automatically adjusts the varying lengths of the belt as the chisel is raised and lowered.

Nickel Steel.

Last week we published some tests of the corrodibility of nickel steel, made with a view to its use for boilers and the underplating of the hulls of vessels. A paper read by Mr. F. L. Sperry at the Florida meeting of the American Institute of Mining Engineers, gives some further information on the subject, which may be of value to our readers. The question of the use of nickel steel is one of so great importance at the present time that all information concerning it is of interest. Mr. Sperry speaks of the use of nickel steel for armor plate, gun forgings, marine shaftings, etc., and indicates that there is still a wider field open for its use for structural steel, heavy castings, car couplers, car wheels, bicycle spokes, gears for motors, and in fact all work where toughness, hardness and malleability are demanded.

Plates of iron or steel and nickel when laid together and heated to a welding temperature may be rolled out into thin plates, having a continuous nickel surface on both sides or one side only. The two metals are not merely welded, but an actual alloy is formed to some depth below the surface of contact. This metal was used in one instance as a sheathing for a steam vessel, it being fastened to the hull with iron nails. After eight months' constant service the nails corroded away, all of the bottom except the nickel sheathing being corroded and foul, while the latter was as clean as when first put on. By using nickel nails it would seem that an ideal sheathing for vessels could be obtained. One recent rather important use of nickel steel is in the 5,000 H. P. generators of the Niagara Falls Power Co. The periphery of the large rotating field travels at the rate of about two miles per minute. The bobbins are secured within a ring of nickel steel forged without a weld and having an outside diameter of $139\frac{3}{4}$ in., and being $9\frac{1}{2}$ in. thick. The ring weighs 24,840 lbs., and is extremely light for its strength. It was used because of the high tensile strength of the metal, it being necessary to resist a great centrifugal force.

Tests which have been made by the Cleveland Rolling Mill Co., of flanged steel with and without nickel show for the nickel steel an average increase of 11,400 lbs. per square inch or about 31 per cent. in elastic limit and of 10,400 lbs. per square inch or about 20 per cent. in ultimate strength. These results were obtained without affecting the ductility of the metal. During the discussion it was suggested by Mr. John Birkinbine that nickel might be added to cast-iron with very beneficial results. If carbon reduces the melting point of nickel, and if nickel absorbs 9 per cent. of carbon whether the latter is in the graphitic or amorphous state, and if, as is further claimed, nickel replaces silicon in iron, the addition of varying percentages of nickel to cast-iron may work radical changes in some features of foundry practice. It is possible that the addition of nickel to soft iron castings may adapt them to purposes for which chilled castings are especially used. Further, the absorption of carbon by the nickel may change ordinary cast-iron into malleable cast-iron. A certain proportion of nickel will also give cast-iron its maximum hardness and may also affect the fluidity and the porosity of castings. The effect which the nickel will have upon the surface of the castings is not well known. It may leave them rough and sandy or may improve their quality.

A great drawback to the use of nickel steel is, of course, as we have said before, the price of nickel. However, its extended use may reduce this as has been done in the case of aluminum. Mr. Sperry gives the present price of nickel as below 40 cents per lb., but sales have been made in Europe at much lower rates. Taking 30 cents as a medium price, the addition of 5 per cent. of nickel to iron for castings will increase the cost per lb. 1.5 cents. If 10 per cent. be added it will of course bring about an additional cost of 3 cents per lb. However, the fact that the actual weight of the metal will be decreased and its strength increased will reduce this somewhat. If nickel added to iron prevents its corrosion the permanence of such castings would readily justify any such extra cost. Even with the present cost of nickel it would seem that the results obtained by using it in certain work would amply justify the additional expense of its use. This is shown very clearly in the extended use of nickel steel armor at the present time.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Gross earnings for August are not quite up to what we had hoped. The *Chronicle* has compiled the returns for 134 roads and over 100,000 miles of line, showing an aggregate increase of 1.63 per cent. August of 1894 was somewhat abnormal, having followed the coal strike and the Pullman strike, with the consequence that an unusual volume of business was crowded into that month. Another reason, and probably the most important one for the poor comparative showing, is the small movement of winter wheat consequent on the short crop. The Atchison is the only road that shows a loss of over \$100,000, the Rock Island coming pretty near it, however, with a loss of \$91,000. Four roads show increases of over \$100,000, namely, the New York Central, the Milwaukee & St. Paul, the Mexican Central and the Missouri Pacific and Iron Mountain.

The Termination of the New York, Pennsylvania & Ohio Company.

The old New York, Pennsylvania & Ohio Railroad will soon cease to exist. On Sept. 6 the first mortgage bondholders met in London and authorized the voting trustees to commence foreclosure proceedings in order to turn the road over to the new consolidated company which is to take the place of the Erie and its subsidiary lines. In connection with this the trustees have published the scale of exchange by which the new company's securities are to take the place of the old.

The Erie plan of reorganization is one of the most severe which have been put through successfully, but that part of it which deals with the New York, Pennsylvania & Ohio is now seen to be the severest feature of the whole. Never was there a more vigorous boiling down of capital. As it stands to-day, the Pennsylvania & Ohio is a ludicrous example of over capitalization, and has been disastrous to the foreign investors, who hold nearly all the securities. This company emerged from the foreclosure of its parent company—the Atlantic & Great Western, which had had a picturesque and wholly disastrous history of its own—with an increased burden of capital, and their burden has been steadily increased by the specious practice of capitalizing unpaid interest. The increase from this scheme has been peculiarly rapid, because practically little interest has been ever paid on any of the three mortgages. In fact, the charges on the small sum of \$8,000,000 prior lien bonds, which come in ahead of the three other classes, used up about all the net earnings each year, and left nothing to be paid as interest on the worthless mass of paper of various kinds and degrees which followed after. The absurdity of the amount of "securities" attached to this property, which is a single track road of about 430 miles, is clear enough from the following figures:

Prior lien bonds.....	\$8,000,000
First mortgage.....	71,877,000
(This includes deferred interest warrant for \$24,500,000.)	
Second mortgage.....	\$13,680,000
Third mortgage.....	29,000,000
Equipment trusts.....	2,000,000
Preferred stock.....	10,000,000
Common stock.....	35,000,000
Total.....	\$169,557,000

Of course in any decent reorganization there would have to be a big scaling down of all this overvaluation. By the present scheme \$40,714,000 new securities take the place of all the old ones with the single exception of the \$8,000,000 prior lien bonds which remain as they are. Thus we have approximately a reduction from \$160,000,000 to \$40,000,000 or just to one-fourth, which is the most striking example of a thorough boiling down of watered capital that we have ever noted.

The reorganization is completely in the interests of the first mortgage bondholders. That it should be so is clearly justified by what has already been said. Of the new securities of the Erie Company which are set aside for the New York, Pennsylvania & Ohio, the first mortgage holders receive seven-eighths.

The allotments are as follows:

Old securities in amounts of:	To be exchanged for new securities:
1st mortgage.....\$5,000	Prior 1st Pref. 2d Pref. Com.
2d mortgage.....500	10,000 \$500 \$100 \$750
3d mortgage.....1,000	Assessed \$12 per \$100
Pref. stock.....6,000	100 100 100
Common stock, 10,000	100 100

The adjustment made for the old common stock in this table is rather startling, as for \$35,000,000 of the old only \$350,000 of the new stock is allowed, with the required payment of \$12 a share. The plan thus practically wipes out the old Pennsylvania & Ohio stock and the third mortgage, and gives the property a chance of life again. Its incorporation into the new Erie Company is also a very promising feature, for as an integral part of one large road it is certain to do much better than as a separate company operated under rather unfavorable leases. Considerable sums are needed for improving the property. Under the past financial conditions it has been impossible to raise money for this purpose or to reach any sound financial footing. Now these difficulties will be removed, and as part of a large through system this road will undoubtedly make a favorable showing.

For the last three years the earnings of the road have been: 1892, \$7,209,717; 1893, \$7,379,349; 1894, \$5,934,667. The loss to the Erie from operating it as a leased line has been in 1892, \$425,888; in 1893, \$197,106; in 1894, \$707,399.

Ventilation of Passenger Cars in Summer.

Although the summer of 1895 has now departed, the ever present and perplexing question of the ventilation of passenger cars is still here. It is true that the question of ventilation will soon assume a different phase; will become a question of how to get warmth into a car instead of how to get it out; but the troubles of the day car passenger in summer are very real and will recur again next summer as surely as the world rolls round, and possibly some of us who may have problems in this field to settle then would do well to begin considering them now. The criticisms and complaints of passengers, which are the sharpest incentive for action in this matter, are now at their height, and there are more of them (counting only the intelligent ones) than ever before. Their intensity is of course greatest at the end of August, when the charms of summer have been mostly transformed into commonplace vexations, and everyone is growling at something or other.

A sample criticism is that of a Buffalo correspondent, writing to the *New York Tribune*. He says:

Have the railroad authorities no rules for regulating the indiscriminate ventilation of passenger cars by private individuals? The other day, in going from New York to Buffalo, it was my fate to sit behind an untraveled barbarian who persisted in keeping the window open during the entire journey. I was thus forced to ride for 11 hours in a hurricane of smoke and cinders that nearly put my eyes out, and left me with a cold, from the effects of which I have not yet recovered. It was useless to appeal to the conductor, he having no authority over the action of passengers in such cases, and equally useless to try a change of place. The fresh air fiend seems to have a devilish instinct for establishing himself on the front seats, whence the cyclone of dust and dirt in which he revels may sweep through the entire car, to the discomfort of the greatest number of victims. Now, I would respectfully suggest that the railroad authorities themselves take this matter in hand and remedy the abuse, as they can easily do, with perfect equity to all parties, by setting aside a certain number of seats in the rear of each passenger coach for those who enjoy the current of "fresh air" that follows in the wake of a locomotive, and absolutely prohibiting the opening of windows in the forward part.

Other correspondents followed, suggesting various remedies. One wants at every window a screen, such as is used in Pullman cars, to be removed only by the conductor or brakeman. A New Jersey woman says that she raises her umbrella in front of her and thus causes the cinders to fall upon the vicious person who is the cause of the trouble, and these cinders, even though they are cold, have the well-known moral results of coals of fire, when they fall upon the malefactor's head. A more business-like woman, Fanny Kellogg, says that she pins a stout newspaper up in front of her, fastening it to the side of the car and to the back of the seat by three stout, ordinary pins.

The reader will have noted by this time that our title, which had to be short, does not precisely define our

subject; that this is not intended to be an essay on methods of ventilation proper. That problem has well-known limitations which we do not care to disturb at this time. The present question is, Assuming that we must admit to the cars in summer a large supply of out-door air, not too much when the train is running rapidly and yet all that we possibly can when it is standing at a station, how can we avoid dirt and objectionable drafts?

The Buffalo man must have seen, without being told, that suitable rules cannot be formulated, much less enforced. The assignment of back seats would be harder to manage even than the car-seat hog question. Windows not to be opened would have to be locked, and that would make trouble, for our complainer himself would want his window open some of the time. The brakeman, even if he be an accomplished hotel clerk, cannot attend to forty windows all at once. Theoretically, he might lock all the windows simultaneously by time-locks electrically controlled, soon after leaving the heating-chamber, commonly termed a head-house, and open them before the next stop; but practically, even if this mechanical suggestion were reasonable, he could not suit the passengers by such a method. The temperature of a well-filled car rises so rapidly when the openings are closed, and the drafts so easily become violent when windows and doors are opened, that no one person could think of pleasing a car-full. Even with windows bolted down and the patent crank's ideal ventilating apparatus in full operation, our troubles would not be half cured.

Probably we shall always have to have openable car windows. That much must be conceded to the traditional spirit of American independence. With 40 windows and 40 sovereigns in a car, what shall we do? Any observant traveler will often have noticed that if each passenger could control the window opposite the seat in front of him he would be much better off than now, even with the control of his own window taken out of his hands. But this is out of the question, for a large share of the people who travel are much like the Englishwoman who would hold no intercourse with one to whom she had not been introduced, even when she was drowning. We are inclined to think that the *Tribune* correspondents have the germ of the most practicable idea. A folded newspaper is not available in the majority of cases, and not every one could adjust it in good shape with "three stout, ordinary pins," even if he had them; shields outside the window would not probably prove a practicable and satisfactory solution, for they could not be attended to without additional porters, and the passengers would break or lose them rapidly if left to themselves. But a shield inside the car, Fanny Kellogg's newspaper changed into a wooden or metallic shield, shaped scientifically and attached to the car so as to be conveniently opened or closed, ought to be a very satisfactory contrivance. There must be an ample supply of ingenuity in the car shops to make the right thing. It would be desirable to have such a shield normally in position, so that a passenger would have to take action only when he desired to have the breeze from his neighbor's window, and to accomplish this, while not obstructing the light or impairing the cheerfulness of the car, might be somewhat difficult, but not impossible.

While we are waiting for this invention the railroads can soften the wrath of passengers a good deal by being liberal with room. It requires a stretch of credulity to believe that the Buffalo man and his tormentor were thus practically chained to each other for 11 hours; but if they were, the road ought to have put on another car. If the sufferer will go by the X. Y. Z. road next time, we feel sure that he will find an opportunity to change his seat. It is recorded in ancient history that the New York Central used to be stingy with common cars for the purpose of helping Wagner, but—this man does not say what road he traveled over. Certainly he did not go on the Empire State Express, for he says he was 11 hours on the road. A tender regard for the interests of the palace car company is not wholly a thing of the past, however, for a friend of ours recently encountered it on another road as big as the Central. Finding the sleeping car old and rickety, he asked the porter why a better one was not furnished; "because," said the darkey, "they want to make you travel on the Limited."

While we are on the subject of passenger cars, we cannot do justice to our feeling of friendship for certain superintendents without again reminding them that they still furnish opportunity for a great deal of just criticism from passengers who want to get windows open instead of to shut them. Windows stuck down by varnish are still so common that we sometimes wonder whether certain master carbuilders ever heard that passengers swear about them in hot weather. We recommended Colonel Majoribanks' remedial device to them last year and the year before, but

they do not adopt it, and hundreds of passengers get hopping mad because when they are most exhausted by heat they have to make the most violent exertions to get a car window open, and often to no effect. A car that has stood in the sun for two hours on a summer day, or even in a train shed, is a perfect oven, and yet passengers are called upon to use such a car under the most uncomfortable circumstances; that is, they must, for convenience, sit in it for from three to ten minutes before the slightest breeze can be had. That length of time is enough to prepare one for two Turkish baths.

Fast Time in England and America.

The fast run over the New York Central from New York to Buffalo on Sept. 11, which we reported briefly in our last issue, was so very nearly equal, in average speed, to the best English run, that the comparison of the two records has led to a great deal of discussion, and if the political newspapers that are short of issues become awake to the situation we are not sure but an international controversy can be cooked up. Such an outcome would be an agreeable change from bimetalism.

But, as we remarked in discussing the English records in our issue of August 30, there is really no ground for strife, and it requires a pretty careful and minute review of the records to find a basis for approximate comparison. To show the variety of modifying conditions that must be taken into consideration we have gathered the main facts of the best American and the best English runs in tabular form, as below:*

	N. Y. Central, New York to East Buffalo.	West Coast, London to Aberdeen.
Date.....	Sept. 11, 1895	Aug. 22-23, 1895
Weight of cars.....	565,000 lbs.	150,080 lbs.
Distance through, miles.....	436.32	539.75
First stage.		
Length, miles.....	142.88	158.
Departed.....	5:40:30 a. m.	8:00 p. m.
Arr. terminus.....	7:54:55 a. m.	10:27:30 p. m.
Time.....	2 h. 14 min. 25 sec.	2 h. 27 min. 30 sec.
Speed, m. p. h.....	63.79	64.27
Engine.....	No. 870	No. 1309 compound
— cylinders.....	19 × 24 in.	Two 14 × 30 in. One 74 × 30 in.
— drivers.....	84 in.	84 in.
Second stage.		
Length, miles.....	147.84	141.25
Departed.....	7:56 45 a. m.	10:30 p. m.
Arr. terminus.....	10:17:10 a. m.	12:35:30 a. m.
Time.....	2 h. 20 min. 25 sec.	2 h. 5 min. 30 sec.
Speed, m. p. h.....	63.17	67.50
Engine.....	No. 999	No. 904
— cylinders.....	19 × 24 in.	17 × 24 in.
— drivers.....	86 in.	78 in.
Third stage.		
Length, miles.....	145.60	150.00
Departed.....	10:19:35 a. m.	12:38 a. m.
Arr. terminus.....	12:32:26 p. m.	3:07:30 a. m.
Time.....	2 h. 12 min. 51 sec.	2 h. 29 min. 30 sec.
Speed, m. p. h.....	65.75	60.20
Engine.....	No. 903	No. 90
— cylinders.....	19 × 24 in.	18 × 26 in.
— drivers.....	86 in.	78 in.
Fourth stage.		
Length, miles.....	.....	90.50
Departed.....	.....	3:09:30 a. m.
Arr. terminus.....	.....	4:32 a. m.
Time.....	.....	1 h. 22 min. 30 sec.
Speed, m. p. h.....	.....	66.
Through.		
Distance, miles.....	436.32	539.75
Time elapsed.....	6 h. 51 min. 56 sec.	8 h. 32 min.
Average speed.....	63.54	63.24
Time in motion.....	6 h. 47 min. 41 sec.	8 h. 25 min.
Average speed.....	64.22	63.95

It will be seen that the rate of speed over the Central was just three-tenths of a mile an hour higher than that of the English train. The items in which the difference between the circumstances of the two trains is so great as to make accurate comparisons exceedingly difficult, are numerous enough in the foregoing table; the principal one being that the weight of the Central train was about three and three-fourths times greater than that of the English train; but besides the differences shown above, there were a number of others equally hard to estimate with accuracy. On the New York Central it is said that the train had to reduce speed 28 times. There was a considerable head wind between Albany and Buffalo, which, as everyone knows, retards a fast train considerably when the engine is loaded at or near its full capacity. One of the reports says that the train was detained eight minutes at Spuyten Duyvil on account of repairs which were being made to a bridge. On the other hand, the Central was favored by a pushing engine up the steep grade at Albany, and by the fact that the time at the end of the record was taken at a station where the train did not stop. Ordinary trains are said to take 13 minutes to run through the long street in Syracuse, but it is said that this train took only two minutes.

The English run was made in the night, a fact which ordinarily is classed as a hindrance, though a good

*Detailed records of the seven best English runs were given in the *Railroad Gazette* last week. The train here shown stopped at Crewe, Carlisle and Perth. The New York Central, an empty train, stopped at Albany and Syracuse about two minutes at each place.

many signals can be read more easily in the night than in the day time, and it is by no means certain that the darkness was a disadvantage. It is said that the English train stopped at Aberdeen ticket platform, thereby losing two minutes, though this fact is not mentioned in Mr. Pattinson's report published in these columns last week.

The great disadvantage of the Central in the race was the weight of the cars. On the English road it was the grades. There are long stretches where the line ascends at the rate of 26 ft. per mile; there is one grade 13 miles long of 44 ft. per mile; one 5 miles long (at Shap) 75 ft. per mile; one 10 miles long of 68 ft. per mile at Beattock, and one 6 miles long of 59 ft. per mile at Kinbuck. As compared with this profile the New York Central has, we believe, but one serious adverse grade—that of three miles between Albany and West Albany, where, as we have said, a pushing engine was used. There is a short 44 ft. grade near Batavia. (We do not find that helping engines were used on the English train of Aug. 22, although they had been employed on many of the fast runs, especially on the East Coast Line.) The total number of grades on the New York Central is shown below:

	Number of grades.	Total ascend. 1,855 ft.	Miles of up grade. 114.49
Ascending.....	184		
		Total de-cent. 1,318 ft.	Miles of down grade. 101.43
Descending.....	159		

The English correspondents say that accurate reports of the time are very hard to secure; there was one difficulty of that kind here. The first report said that the Central train arrived at East Buffalo at 12:34:57; the next day it was stated that this was an error in reading the record, and that these figures pertained to Buffalo and not East Buffalo. But on comparing them with the corrected figures given for East Buffalo, it appears that the train must have run between these two places in 2 minutes 31 seconds, which, as the distance, according to the New York Central time-table, is 3.26 miles, makes a furious rate of speed—77.7 miles an hour through a complicated city yard.

It appears that the English train did stop at Crewe. The time to Perth, 449½ miles from London, was 427½ minutes, equal to 63.05 miles an hour. Whether engines were changed at Perth we are not informed.

General Passenger Agent Daniels has issued a circular giving the principal facts of the Central's run, in which he states that the private car, which formed a portion of the train, was attached to the eastbound Empire State Express at Buffalo and returned at once to New York, where it arrived at 10:19 p. m., thus making a round trip equal to a straight run of 17 hours, New York to Chicago. Had the special been continued west of Buffalo at the same rate of speed, it would have reached Chicago in 15½ hours from New York. The circular states that the cars made a train 337 ft. long. The private car was very heavy, thus making the whole train 20 tons heavier than the Empire State Express. There were only about a dozen persons on board. Vice-President Webb tells a reporter that the Empire State Express, with seats for 218 passengers, earns about \$90,000 a month, eastbound and westbound or more than a million dollars a year.

We have thus given the principal facts published concerning these runs so that the reader can make for himself such comparisons as he sees fit. The power of the locomotives, the most interesting feature in the whole matter, cannot be compared, because we have not at hand the weight, heating surface and boiler pressure of the English engines; neither do we know anything about the amount of fuel used. Even if we had this information a number of important intermediate factors would remain. The New York Central has made a splendid run. It has powerful engines. The Englishmen thus far have not seen fit to build such engines, although, of course, they know how; and, moreover, they seem to have taken no special pains to use their newest engines in the trials they have made this year.

In the September time-table of the London & North Western the 8 p. m. express to Scotland is timed to arrive at Aberdeen at 6:25 a. m., making the rate, through, 51.8 miles an hour, a trifle faster than the Empire State Express.

Concerning the "Columbia" Type of Locomotive.

The following paragraph appeared not long ago in a railroad paper which makes some claim to authority and responsibility.

"In a recent report to the Board of Trade concerning an accident upon the Great Western Railway of England, Major Addison, R. E., is reported to have stated that engines of the trailing bogie class running at high speeds

produce a damaging effect upon the road. He considers that the derailment of a following train was caused by the fact that the road had been so knocked about by an engine of this class as to be responsible for the accident. He thinks a different class of engines should be provided for running at high speeds."

One operating officer, seeing the item, referred it to his Superintendent of Motive Power to learn if it were true that the Flying Dutchman and Columbia types injure the track, as both have trailing wheels. Naturally there is considerable interest in this as nearly all large lines are thinking of the use of the Columbia type on high speed trains. One Superintendent of Motive Power writes to us: "Please note the enclosed clipping. At first sight this might look like an unfavorable comment on the Columbia type of engine. We find, however, by referring to *Engineering*, July 12, page 47, that the probable cause of the accident was a very unwarranted condition of track on the road in question. The track gage seems to have been 1 in. out in many places, and the ties so rotten it was difficult to keep the line in gage. It may be that some 'innocent' on the — got things mixed and enlarged on his imagination. Do you know what ground they have for making such a statement? In view of the headway that the Columbia type of engine is making in this country it seems to me a statement of this kind ought not to go unchallenged."

On receiving this we wrote to the Baldwin Locomotive Works, the pioneer builders of the Columbia type. Their reply is as follows: "Why should a clipping from an irresponsible paper, relative to trailing bogie locomotives at high speeds on English railroads have a bearing upon the Columbia type of locomotive? There is a radical difference in the construction of the two machines. The Columbia type of locomotive is nothing more than a mogul engine with which we have had years of experience in this country in all classes of service, and some roads are at the present time hauling their fastest trains with them. The experience of the Philadelphia & Reading Railroad with Columbia type locomotives having 78-in. driving wheels and 48-in. trailing wheels has been very satisfactory indeed, and although these locomotives run faster and work harder, they are not nearly so hard on the track as other types of locomotives they have in use. The same has been the experience of the Atlantic Coast Line Railroad between South Rocky Mount and Florence, where the track is not so good as on the Reading, the rails being very much lighter, and the railroad company, after several months' experience with these locomotives, are surprised that although carrying some 30 per cent. more weight on driving wheels, they can discover no damage whatever done to the tracks by them. The engine 'Columbia,' which we exhibited at the World's Fair, has been running on several railroads in this country and the evidence of those riding upon her is entirely in favor of this type of locomotive for high speed service."

The Columbia type is simply a mogul or a 10-wheel locomotive with the rear parallel rod removed and the rear wheel made smaller so that the firebox can be extended laterally over it and in that way a large grate may be used without raising the boiler so high as with the Wooten type. It is not possible for this type to be any more severe on the track than a mogul or 10-wheel locomotive.

Annual Reports.

Fitchburg.—The 54th annual report of the Fitchburg Railroad Co. is for the year ending June 30, 1895, and shows the unusual result of a gain as compared with last year. The figures are given in the table below. Under passenger earnings are included express, mail and miscellaneous, and under other income are included rentals of roads and property and receipts from elevators, wharves, etc.

	1895.	1894.
Miles worked.....	457.79	450.32
Passenger earnings.....	\$2,348,289	\$2,419,396
Freight earnings.....	4,562,668	4,173,197
Other income.....	556,583	272,562
Gross earnings.....	\$7,237,734	\$6,865,155
Operating expenses.....	4,970,766	4,808,911
Net earnings.....	\$2,266,968	\$2,056,244
Taxes, interest and rentals.....	1,518,115	1,543,948
Balance.....	748,843	517,296
Percentage of operating expenses.....	68.68	69.97
Dividends to the amount of \$681,807 were paid.		

The passenger miles fell from 114½ millions to 112½. The passenger rate fell from 1.85 to 1.82 cents. In freight the tons carried as well as the ton miles increased, the ton miles in 1894 having been 456½ millions and in 1895 505.8 millions. The rate per ton-mile fell from 0.914 to 0.9 cent. The average freight-train load was 147 tons in 1894 and 159 in 1895, and the average haul in 1895 was 114.45 miles, being about 2½ miles further than in the preceding year.

The President says that the condition of the property has been maintained by charging to operating expenses large sums for renewal of equipment and a considerable sum for the building of new stations and other purposes. Ten heavy locomotives and 13 passenger coaches were bought during the year. The work of replacing light bridges and strengthening others, which has been in progress for several years, has been completed and heavier locomotives are now in use. The elimination of grade crossings has been continued.

In the items of maintenance of way and structures operating expenses rose from \$794,776 to \$812,543, and in maintenance of equipment the expenditures increased from \$648,799 to \$817,185.

New York, Ontario & Western.—This report is for the year ending June 30, 1895.

	1895.	1894.
Gross earnings.....	\$3,669,113	\$3,842,120
Operating expenses and taxes.....	2,612,412	2,731,545
Net earnings.....	\$1,056,701	\$1,109,574
Surplus.....	326,383	419,567

The receipts decreased in all items. Operating expenses were reduced somewhat under the items of conducting transportation, of motive power, of maintenance of way and of general and miscellaneous expenses. Maintenance of cars was slightly increased. The passengers carried and the passenger miles were less than in any one of the past six years, while the freight tonnage and the ton-miles were greater—that is, the ton-miles in 1895 were 114½ millions and in 1894 they were 359½ millions. The Scranton division was opened June 30, 1890, which, of course, resulted in a large increase in coal tonnage, so that the total ton-miles have grown year by year. The ton-mile rate, however, has fallen from 0.931 cent in 1892 to 0.837 in 1895. The earnings per freight train mile, however, notwithstanding the decrease in rate, rose from \$1.51 to \$1.57 in the same time, while the expenses fell from \$1.09 to \$1.07. The average freight train load was 164.2 tons in 1894 and 179.7 in 1895.

An excellent detailed account is given of the improvement in rolling stock and in road and structures made during the year and charged to operating expenses and to construction and improvement account. In fact, the whole report shows a laudable effort to put the stockholders in possession of full and accurate information, and it has the further merit of having been audited by a disinterested firm of public accountants, in which the officers of this company set an example of a practice which we hope will before many years become common.

After the first of next January the trackage contract between this company and the New York Central & Hudson River, the lessee of the West Shore will be entirely revised. Heretofore it has been on a train mileage basis of 20 cents per train-mile for each passenger train of eight cars or less, and 30 cents per train-mile for each mixed train of 40 cars or less. Hereafter the New York, Ontario & Western will pay its proportion of the cost of maintaining the line between Cornwall and Weehawken, and its proportion of the interest at 4 per cent. on \$2,000,000, and on such sums as have been actually expended for necessary improvement since Jan. 1, 1886. The proportion to be paid by the Ontario & Western will be in such ratio as its train mileage bears to the entire train mileage passing over the tracks.

The common stock of the company has been in a voting trust for the last 10 years, this trust to be terminated when a dividend on the common stock shall be earned and paid. The question of paying a small dividend and terminating the trust has been carefully considered. Representatives of a large majority of the common stock held abroad as well as at home, have advised that the voting trust as at present constituted is not detrimental, but on the other hand is to some extent a safeguard and protection to the owners of the bonds as well as to a large majority of the stockholders. The proposition to pay a small dividend with the sole object of terminating the voting trust is looked upon as misleading and inexpedient. The directors and officers conclude that it is best to postpone such dividend at present, but as soon as the financial condition and surplus earnings justify the payment of the dividend and the continuation of an annual dividend on the common stock, it will be declared without hesitation or unnecessary delay. On the whole, it is held by the President that the voting power has not been abused and that it has not been detrimental to the interests of the stockholders who for the last 10 years have loyally supported the present management. From such knowledge as we have of the situation we are inclined to think that the President is quite right in this conclusion.

Care and Maintenance of Telegraph Lines.

The telegraph department plays an important part in railroad service, and upon its proper organization, operation and maintenance depends much in the way of successful railroad operation. A short review of some of the features of the telegraph service may accordingly not be out of place.

The business arrangements under which the original pole and wire lines were built, and the present ownership, vary widely upon different roads, in some cases the ownership being entirely in the hands of a telegraph company, in others partly in those of the telegraph company and partly in those of the road, while again some roads own and operate all the wires along their lines. No matter how the ownership may be, the usual rule is for the railroad to do the actual work in operating the lines, and the work of maintaining and repairing is also usually done by the roads.

With few exceptions in the United States, the poles used for telegraph lines are almost always of wood, mainly of white cedar, stripped of the bark. In some sections of the southwest, dimension timber of yellow pine is used, and on the western coast fir. No particular system of treating the timber for poles has come into general use, though it is probable that any of the methods used for ties will be useful for poles also. Fire, wind, lightning, the need of larger wire carriers, and gradual dismemberment through repairs probably use up more poles than does decay pure and simple. Keeping grass and weeds away from the base of the

pole, or painting the bottom with mineral paint, will prevent damage from fire to a great extent, and in exposed places wires are often run from the top of the poles into the ground to afford them protection from lightning. These wires should be run without regard to protection of the telegraph wires proper, and hence should be kept as far from them as possible, to avoid leakage. Cutting and notching of the tops in changing wires should be avoided, and it is well to cover all notches for cross arms with mineral paint, as well as to paint the cross arms themselves. A new steel pin has recently been adopted for the support of insulators on cross arms. The top of the pin is provided with a wooden sleeve, which fits in the insulator, and the bottom with a collar to rest upon the cross arm, secured by a nut underneath. These pins are dipped in insulating material at the time they are used, making them preferable to the old style wooden pins, and the strength and durability is much greater than when of wood.

It should go without saying that the insulation of the wires ought to be perfect, and, without making any comparisons between the various types of insulators now in the market, we would call attention to the fact that such kinds as are adopted should be properly used, and not, when replaced by section men, put on upside down, as is sometimes the case, forming water cups and thus making a good ground connection at the first rain shower. In turning into station buildings, the porcelain insulators ordinarily used have often been so placed that when exposed to the weather a large leakage results through the connection of a wet surface to the ground. Care should be taken that building connections are sheltered as far as possible by the eaves. Wires passing under the eaves from the office pole where they are liable to get wet should go to insulators outside, and thence upon an upward incline to points where they enter the building, thus preventing water running down into the wood of the building, forming wet contacts, high resistance and not infrequently an escape. Cleanliness in all the fixtures and connections inside the office building is absolutely necessary, so that the insulation shall be complete enough to prevent leakage to the ground, or to other wires.

The wire of a telegraph line should be large enough to give a low resistance, and on lines having a heavy business should be of copper, if possible, thus allowing of the use of multiplex instruments. Care should be taken that the points where the wires join should be well twisted and soldered. In case of repairs a large wire should be used, even if the balance of the line is of smaller wire, or if it has rusted so that the sectional area at places has been reduced. Having even a portion of the line replaced by a larger wire reduces the total resistance of the line, notwithstanding the smaller dimensions in other places, thus saving battery power. The conductivity of the line is often impaired by want of care in adjusting binding screws, by using instruments with too high resistance and unnecessary looping around yards, over small branches and in offices.

Crosses, short circuits and induction are familiar items of trouble, and care should be taken to avoid these difficulties, but close and systematic watch and testing of every line and office will be necessary. Modern apparatus for making accurate and rapid tests has been brought to such a high degree of perfection that the absolute time used in detecting the condition of wires and instruments, and applying remedies for any defects, is very small as compared with the best methods in use even 10 years ago.

The steady growth of electric lines for street railroads, electric lighting and telephones, necessitates additional care where such lines cross the railroad, and proper nets or other protection should be put up to prevent the wires fouling at such places, with consequent trouble and damage.

A multitude of little every-day details makes up the whole of a successful working telegraph plant, and such details have to be systematically checked from time to time to see that the men immediately concerned are attending to their business. A little dirt, or a few filings allowed to accumulate in a switchboard or lightning arrester, a carelessly made solder joint in the main wire, neglect to fasten a binding screw, or neglect to maintain good local ground connections, may each and all cause delay and consequent expense at some critical period. In the care of an office, the operator should understand that watchfulness and attention to all details is just as much a part of his necessary qualification as to be able to send and receive. An operator who would not for a moment allow his key to remain open, thus delaying traffic and making work for his co-laborers in locating the break, often neglects to interest himself far enough to keep his cut-out plugs and disks clean, so that he may know positively that he has not broken the circuit by allowing dirt between contacts. The same may occur through a wire getting loose and pulling out from a binding post, or the contact point under the relay may become loose through seasoning of the base. It is the operator's place to be familiar with this, and to know that the trouble is not in his office or relay when the wire is open and his key is closed. The closing of a key does not always close the circuit.

In short, constant watchfulness and the care of every detail, no matter how small, is as necessary in the telegraph department, and is as much needed for good results, as in any other branch of the service. And as we

have a great variety of "talent" to deal with in the hundreds of operators on a large railroad, there is a constant duty devolving upon the officer in charge to see that the efficiency of every individual operator is brought to as high a state as possible. It is only in this way that the average efficiency can be kept high, for the continual changes, bringing in inexperienced persons, tend to keep it down.

In the Cab of a Fast Locomotive.

Naturally the reporters love to make a good "story" about the most commonplace matter, and have come to consider it their business to make copy which shall be acceptable to the gobemouches. A very fast locomotive run gives them a fine opportunity for a display of their powers of invention. It is true that the metropolitan journals have less arrant nonsense on this subject than may be found in the "provincial" papers, but we read the other day, in a New York daily the following formidable account of the effect of this business on the enginemen and firemen:

"Modern methods of fast travel on land and water not only wear out machines and railroads but such a physical strain is involved in them that human lives are also rapidly used up. A continuous strain is placed upon the engineer and fireman of a fast express train that outsiders scarcely appreciate. When the train is moving at 60 miles an hour the engineer has a dozen things to watch and attend to at once, while the cab is being shaken and swayed in a terrific manner. The fireman is constantly feeding the furnace with coal; the din and noise are deafening, while the flight of objects past the windows makes one dizzy and sick."

The picture is alarming indeed. Imagine the engineer with a dozen handles to manipulate all at once, the whole horizon to watch, and all amid a terrific din and shaking! The situation calls for an individual with Paderewski's capacity for rapid motion, the quickness of vision of a hunted Indian, the ear drum of a boiler-maker, and the balancing instinct and prehensile power of a sailor in the shrouds in a gale. All of which is simply nonsense. The engineer is a remarkably placid fellow, with a habit of deliberate precision in his look and motions. He is about the last man in the world to clutch at a dozen things at once. He occasionally turns a calm eye to his gages and then resumes his quiet watch ahead. The three levers which he has to manipulate are under his hand ready for instant use, and when they are used it is quietly and in order, as an organist pulls out his stops. The noise in the cab makes conversation difficult, but is far from "deafening," while the "flight of objects past the windows," instead of making "one dizzy and sick," is entertaining. The noise is not as bad as that heard in a car when passing another train, with or without the windows open, and in looking out of the engine cab the objects are approached gradually, not rushed past as when one looks laterally out of a parlor car window. The fact is the engineer does not look at the side—he is looking ahead, and therefore the speed seems less, as the objects are approached gradually.

Those who have ridden at 90 miles an hour on a locomotive know that on a good road (and there are many such) the engine is not "shaken and swayed in a terrific manner," but is rather comfortable, and the speed is not so apparent as when one is riding in a parlor car, where only a lateral view is had. The engineer can be very comfortable if he is quite sure of the track ahead, and it is only in rounding curves or in approaching crossings that he feels nervous, and it is doubtful if it is any more strain to run a locomotive at high speed than to ride a bicycle through crowded thoroughfares. Judging by the countenances of the bicycle rider and the engineer, the engineer has rather the best of it.

The right of a witness to refuse to give testimony tending to incriminate himself is again under discussion, a decision by Judges Acheson and Buffington at Pittsburgh Sept. 11, in the habeas corpus proceedings taken by Auditor Brown, of the Allegheny Valley Railroad, being held to conflict with the views of Judge Grosscup sufficiently to warrant an appeal to the Supreme Court of the United States. The Washington correspondent of the *Journal of Commerce* (New York), speaking of the refusal of Auditor Brown to testify before the Grand Jury at Pittsburgh, says:

"This decision sustains the legality of the Act of Feb. 11, 1893, and it will probably be affirmed by the Supreme Court. Section 860 of the Revised Statutes purported to afford immunity to witnesses against the effects of criminalizing themselves, and purported to be in conformity with the Fifth Amendment to the Constitution. When the Supreme Court decided in the Counselman case that Section 860 was not broad enough to conform with the Fifth Amendment, the Act of Feb. 11, 1893, was passed to correct the defect. The reason for believing that this Act is within constitutional requirements and the history of the controversy over it were thus referred to by the Interstate Commerce Commission in its last annual report:

"Its passage was a direct result of the decision of the United States Supreme Court in the Counselman case in which it was clearly intimated that Congress has the power to make a law under which unwilling witnesses could, through provision therein for protection from the legal consequences of their testimony, be compelled to give evidence concerning their knowledge of criminal transactions. It was doubtless presumed by Congress, when this act was passed, that the Supreme Court had considered all the conditions surrounding a witness who should refuse to testify on the ground that his testimony might tend to incriminate himself, especially the effect of enforced disclosures upon his character. But during an investigation held by the Federal Grand Jury at Chicago, some months since, Judge Grosscup decided in the case of James, who had pleaded his privilege and refused to testify, that it is beyond the power of Congress to pass a

law which would afford protection to a witness as broad as the immunity provided in the Constitution, and the chief basis of the decision was that while a witness might be freed by such a law from the legal consequences of his testimony, the government could not by any enactment save him from the disgrace and taint upon his character which a disclosure of his connection with crime might entail. As no appeal could be taken from this ruling, it will not be possible to obtain the decision of the Supreme Court upon this point until the question can be raised in another jurisdiction, an order obtained directing the witness to answer, and an appeal be taken by the witness to the proper appellate court."

The Commission recommended a law providing for appeals by the Government from decisions of this character, but they will probably make less of an effort in this direction in view of the fact that they have secured a favorable decision from a circuit judge, which they believe can be successfully defended if appealed by the railway people to the Supreme Court.

To carry a passenger for nothing—for no consideration but friendship—is a discrimination against those who pay their fare and, presumably, an unjust discrimination. Therefore, in the case of an interstate journey, it is obnoxious to the second and third sections of the Interstate Commerce Law. This is the view that has been held by railroad officers a thousand times since March 4, 1887, when refusing passes. The Interstate Commerce Commission has held this view, notably in the case against the Boston & Maine, Dec. 29, 1891; but we do not recollect any formal decision on the point from the courts, which was not qualified by some side issue or some statement indicating that the writer of the decision meant to avoid making a direct deliverance if possible. We call attention, therefore, to a paragraph in our railroad legal decisions recently (page 578, issue of Sept. 6, first decision), from which it will be seen that a Federal judge has taken occasion to speak on this subject. This utterance was by Judge Morrow, in the District Court for the Northern District of California, and was made in the case in which President Huntington, of the Southern Pacific, was indicted for issuing a pass for which the recipient said no consideration was given. There was no conviction in this case, nor even a trial, the Court at New York which was asked to order the accused sent to California having held that, as the holder of the pass did not actually cross a state line (he started from San Francisco intending to go to Ashland, Oregon, but was stopped by the strike of 1894), there was no violation of the law; but the statement by Judge Morrow seems to have been made after a careful examination of the facts and the law.

The California Railroad Commission, according to a telegraphic report in the New York Tribune, has adopted, after much discussion, a resolution ordering an immediate horizontal reduction of 8 per cent. on existing freight rates on grain, and also a resolution providing that the Commission shall at once proceed to rearrange the existing rates on all commodities so as to provide for a general average reduction of 25 per cent. from former figures, credit being given to railroad companies for such reductions as their managers have made voluntarily since the beginning of the year. The despatch adds that the Southern Pacific is preparing to fight the proposed reduction in the courts. This action of the Commission follows a series of protracted hearings which were held in pursuance of a resolution offered in the Board reducing all freight rates on the Southern Pacific 15 or 20 per cent. The hearings were devoted chiefly to inquiries into the affairs of the Southern Pacific, to determine whether or not the reduction could be put into effect without working hardship on the company. Officers of the road testified that the freight tonnage of the Pacific system for the year 1894 was 3,714,454 tons, being 578,122 tons less than for 1893. The largest falling off was in grain, coal and lumber.

On the lines of the Southern Pacific's Atlantic System the use of brass checks for checking local baggage has been entirely abandoned, and cardboard checks, attached to the baggage by twine, have been substituted. This change was made tentatively to get rid of the confusion arising from the large number of duplicate brass checks in use, which was due to the fact that the Atlantic System is made up of a large number of separate roads, each of which had a supply of local checks on hand when it came into the system; but the cards have been found so satisfactory that it is said they are likely to be continued permanently. Since the cards were introduced the number of complaints of baggage lost has fallen off, the card checks showing both the point of origin and the destination, thus greatly facilitating tracing. The use of checks showing both stations has also put a stop to the presentation of claims at stations other than where they should legitimately be made. The card checks are numbered consecutively as issued at each station, so that it is much more convenient than with brass checks to keep a handy record of the date on which baggage is checked.

The Pennsylvania Railroad has borrowed one of the light passenger trains of the New York, New Haven & Hartford, and is running it in suburban service to and from Philadelphia for the purpose of seeing how it works. These light trains, of which the New Haven Company has a number (about half a dozen engines and 25 or 30 cars), were built several years ago for service on the Harlem Branch from New Rochelle, N. Y., to 129th street, New York City, connection being made at the latter place with the Second Avenue and Third Avenue lines of the Manhattan Elevated. The cars and engines

are patterned quite closely after those of the Manhattan, and are about the same weight. The vacuum brake is used. The cars have both ordinary steps and a trap-door, by which the car platforms can be adjusted for use where station platforms are on the same level as the car floor. The trains on the Harlem River Branch run each way every hour throughout the day and evening, and the business grew at a satisfactory rate until about a year ago, when an electric street car line took away a considerable share of it at the stations within six miles of the New York terminus.

The General Railroad Inspection of Austria issued orders July 29 last, calling the attention of the railroad managements to the inadequate ventilation of the passenger cars during the summer months, and instructing them to enforce energetically the rules which require the employees to open the car doors and windows, and get them thoroughly aired a suitable time before the trains are made up. A recent sufferer humbly begs the Imperial and Royal Inspection to extend its authority in this particular to this country, and to send its sharpest inspectors with their most effective weapons to watch the parlor cars, which are here so often more like ovens than places for the abode of human beings, while receiving passengers at terminal stations.

There was another legal decision in our issue of Sept. 6 which attracts attention, not from its novelty, but for an opposite reason. It is one in which the Supreme Court of Minnesota solemnly declares that you need not employ a drunkard for locomotive engineer. This reminds us of a story of a former distinguished chief justice of Massachusetts. Rufus Choate, in reading a long deposition in court, several times said "sheeting" where the manuscript read "shirting." The judge corrected him, but the blunder was repeated, and, becoming impatient, the judge growled out, "S-H-I-R-T spells shirt, Mr. Choate." "Yes, yes, your honor," said Choate, "but it did not require a decision of the Supreme Court to establish the fact."

NEW PUBLICATIONS.

Plate Girder Railway Bridges. By Maurice Fitzmaurice, B. A., B. E., M. Inst. C. E., London; E. & F. N. Spon; New York: Spon & Chamberlain, 12 Cortlandt St., 1895, 104 pages with four plates and index. Price, \$2.40.

Mr. Fitzmaurice has prepared this little volume on plate girder railroad bridges from a practical rather than theoretical standpoint. He thinks it better not to look too closely on the theoretical side of the subject since the refinements which may be introduced by theoretical calculations are so often lost by the impossibility of realizing them in practice. For instance, the calculation of a great number of different sections at various points throughout the length of a plate girder is not a matter of value when the section is to be changed only three or four times throughout the length of the bridge. He recommends making the sections a little heavier than theory would require.

He uses whenever possible the principle of equivalent uniform load and gives tables of the same for spans of various lengths up to 80 ft. No calculations or estimates are made for spans over 80 ft., which would fall far short of the lengths used in practice in this country. The general plan has been in England to use latticed trusses in lengths over 80 ft., but on this side of the water plate girders of from 110 and even 123 ft. have been built and are coming more and more into use as it becomes possible to obtain wider web plates. Mr. Fitzmaurice tells us that it would be impossible to get a 7 ft. 6 in. plate for the web of a girder without paying a considerable extra price for it, and he uses 7 ft. 6 in. lengths of plate 4 ft. wide, making splices necessary every 4 ft. The amount of riveting necessitated by these splices and the extra work and increase in weight entailed by the splice plates should condemn the use of such narrow plates as bad practice, and would more than offset any additional cost of plates of such an ordinary width as 7 ft. 6 in.

The author does not give rules for the location of stiffeners, but suggests that they should be put in more with reference to the cross girders or troughs for flooring. Further, fillers under stiffeners are not used, although the author is particular to condemn excessive forging work on account of the expense. The method of turning the ends of stiffeners at an angle so as to clear the flange angles, and then riveting their extremities to the under and upper sides of the cover plates beyond the angle legs is a detail rarely seen in this country.

The different varieties of trough flooring shown are quite interesting. Some of these are for cross troughs and some for longitudinal troughs and are types of flooring in common use in England at the present time. One of these is a cambered trough which Mr. Fitzmaurice thinks possesses some decided advantages over the ordinary forms. Its increased depth in the center gives it greater strength where greater strength is required, and the rain water is further all drained to the center of the trough away from the main girders. It would seem, however, that the drain hole in the flange at its center would be a disadvantage. This, however, is made elongated so as to cut out as little section as possible. The gutter along the bottom is suspended to the troughs by twisted hangers which extend through the hole in the bottom of the trough. Thus no riveting is necessary to support the gutter.

While making a book of some 104 pages upon the sub-

ject of plate girders, it seems strange that the author has not given some space to graphic methods of determining lengths of cover plates, etc., or to the shop work necessary for getting out the iron or steel to be used in a plate girder bridge. A knowledge of shop practice is as desirable as a knowledge of the details of erection in economic bridge design. Further, one might have wished that the author had gone somewhat beyond his province and treated the subject of girders for other work than railroad work. As a book from which one can obtain a fairly good idea of English practice in plate girder construction, Mr. Fitzmaurice's little volume is recommended. It, however, does not go into the subject of plate girder design in the way in which that subject is treated in one or more well-known American books on bridges.

The paper, press-work and the clear, large type are excellent features of the book, while the drawings are all large and plain, the reference letters being easy to read.

The Universal Directory of Railway Officials. Compiled from Official Sources. London: The Directory Publishing Co., Limited, 8 Catherine street, Strand, W. C., 1895. Price 10 shillings.

A volume which should give in small space, and with such distinction of type and arrangement that it could be easily used, the names and addresses of all the principal railroad officials of the world would surely be very useful to a great many people, and it is a work that we have long wished to see. Such is the character of this Directory, published in London within the last few months. It is an octavo volume of 227 pages. The first main portion gives the names of railroad companies arranged by countries, the arrangement under each country being alphabetical. Under the name of the company appear the names and addresses of the principal officers, including in many cases the chief clerks of departments and chief draftsmen. The second main division of the book is a personal index of officers, giving the names arranged alphabetically, the company and reference to the page in the body of the volume where the name and address are to be found. There are also indexes to countries and to railroads. The volume has a number of advertisements and a list of makers of plant and material, etc., which are not without interest.

We have not examined the volume with great care, and should suppose, judging from its size alone, that a good many minor companies will not be found in it. The publishers say that this being the first attempt to publish such a universal directory it is not to be supposed that the book is entirely free from errors, which is probably true. Yet, allowing for any possible omissions and errors, the lists are sure to be very useful.

No American agency for the book is mentioned, but anybody who wants it can easily have it imported through almost any bookseller.

TRADE CATALOGUES.

Cranes.—The Brown Hoisting & Conveying Machine Co., of Cleveland, O., sends a handsome and well arranged catalogue of cranes and crane fixtures. The cranes shown are designed to be operated by steam, electricity or hand power, and include traveling, locomotive, jib and pillar cranes, derricks, etc. Certain directions for ordering are also given in the pamphlet. The company makes a standard 3-motor electric traveling crane very stiff for its weight, compact and thoroughly equipped. Several examples of this are shown. Steam locomotive cranes of 10-ton, 5-ton and 2-ton capacity are shown, also hand truck cranes and hand traveling cranes. Jib cranes are illustrated, operated by electric, steam, hydraulic or compressed air power, and by one, two or three motors. In brief, the variety of tools of this class made by this company is very considerable.

A Tourist Guide to the Continent. The Great Eastern Railway Co., Liverpool Street Station, London, E. C. The Great Eastern has for some time now been running a convenient and popular service from London to the Continent by way of Harwich and the Hook of Holland. The little Tourist Guide, which we have received rather late for the 1895 season, gives useful and interesting information concerning the way of getting to the Continent by this route, and of the cities and places conveniently reached by one who chooses to invade the Continent on this line. A few supplementary pages, which are a striking tribute to the growth of fashion, give several cycling tours which look remarkably interesting.

TECHNICAL.

Manufacturing and Business.

Bryan & McKibbin, Eastern agents for Phillips, Nimick & Co., Ltd., of Pittsburgh, Pa., and dealers in railroad and contractors' supplies, 120 Broadway, New York City, have been appointed General Eastern Agents for the A. Leschen & Sons Rope Co., makers of steel and iron wire ropes, of St. Louis.

The Eclipse Switch & Signal Co., whose factory and offices have been located at Beaver Falls, Pa., has removed its entire business to Elmira, N. Y., where it has an exceptionally fine plant.

The King Bridge Co., Cleveland, O., is very busy on a number of large contracts for bridges and buildings, and for over a year has been running with a large night force. The company is increasing its facilities for getting out work, by the addition of a new brick fire-proof building, about 100 ft. x 200 ft., which will enable material to be

painted and loaded under cover, so that it will be kept from being exposed to the weather from the time it is received until it is finally painted ready for shipment. The King Bridge Co. has for some time made a specialty of the manufacture and complete equipment of docks and railroad terminals, with its patent ore and coal hoisting and conveying machinery. It has lately equipped with machinery the Pennsylvania Railroad Company's dock at Ashtabula, O. The results shown by this machinery have been so successful that an addition to the plant has been contracted for by the King Bridge Co.

The Ingersoll-Sergeant Drill Co. calls attention to the increased use of small compressors in railroad machine shops in connection with the pneumatic appliances in repairing, manufacturing and other purposes. These extended uses lead to the purchase of compressors suited to the amount of work required, and when the full value of air is really appreciated many of the older methods are discarded and the compressed air substituted. The Ingersoll-Sergeant compressor is well adapted for supplying the air agent, and a catalogue giving information is sent to those interested.

New Stations and Shops.

The Southern Pacific Company has recently accepted plans and awarded contracts for the construction of a \$20,000 station house at Palo Alto, the railroad station of the Leland Stanford, Jr., University.

The Jungfrau Railroad.

A scientific commission has been studying the methods to be followed in the construction of the proposed railroad up the Jungfrau, which is likely to be the greatest of all mountain railroads. First of all there is to be a complete trigonometric and photogrammetric survey from the lower station at the Eiger glacier to the summit, the latter survey by Professor Koppe's method. Two routes are proposed from the Scheidegg to the Eiger glacier, and the one selected is to be laid out at once, so that the work of construction may begin as soon as spring opens. Prizes amounting to 20,000 francs will be offered for the electrical apparatus, the superstructure and the rolling stock. The aggregate water power available is estimated at 7,000 to 8,000 H. P. The distance from the first primary station to the lower end of the road will be about 3½ miles, and this section will be built as quickly as possible. On further extension of the tunnel construction, a second primary station will be established 3½ to 3 miles further on. The whole line will be 7½ miles long, and for working it the two primary stations are to be connected. It is intended to limit the speed to 5½ miles per hour on grades of 792 ft. per mile or less, and to 4½ miles on steeper grades. The steepest is to be 1 in 4, or 1,320 ft. per mile. The gage is 1 meter; the sharpest curve of 327 ft. radius. The tunnel will be 10 ft. 6 in. wide and 13 ft. high. It will begin at the Eiger glaciers. A special expedition under the direction of a famous Jungfrau guide was to be made in August to determine the location of stations at the Eiger, the Mouch and the Gaggi glaciers, and ascertain the conditions of the snow accumulations on the ridge leading to the Jungfrau and on the Jungfrau itself.

Chicago Main Drainage Canal.

A meeting of the Board of Drainage Commissioners was held Aug. 21, and the subject of stationary or swing bridges across the canal was taken up. The joint Committee on Engineering and Finance made its report. The majority report was in favor of the construction of stationary bridges, and announced that a contract had been made with the Pittsburgh, Cincinnati, Chicago & St. Louis Railroad for a stationary bridge. The reason for this was that the railroad company is already in possession of the right of way which the Sanitary District seeks to cross with its main channel, and the district is legally bound to put the railroad company in as nearly the same condition after the construction of the channel as it was before, and without expense to the company. The committee says that to erect swing bridges at this time would delay two or three years the completion of the channel.

In the minority report it was said that the difference in cost between swing and stationary bridges would not be more than \$1,250,000, which is a small percentage of the amount to be spent on the canal. They favored the erection of swing bridges. The majority report was adopted.

Communication was received from Chief Engineer Isham Randolph commenting on the Chicago River. He said that from notes and soundings taken it was determined that the flow of that stream was now about 150,000 cu. ft. per second. This, he said, could be increased to 300,000 cu. ft. by the expenditure of a sum of money which he did not consider extravagant. To accomplish this object, it is necessary to deepen the channel, reverse the slope of the bed, and widen the river in some places by setting back the dock line. Some of the bridges would have to be rebuilt; in cases where this was not possible, as at Adams, Jackson and Van Buren streets, and at the Metropolitan Elevated, by-passes would have to be constructed. In order to increase the flow of the river the channel would have to be dredged to a depth of 20 ft., the dock line removed 12 ft. and slope made on the basis of one to five. The cost of the work he estimated at about \$872,500. The passes around the bridges at the streets named would have to be built under the tracks of several railroad companies. This work would interfere with the roads temporarily. After the passes were completed they would be floored over,

and the railroads would have the use of the right of way again.

At the meeting of the Board of Trustees on Aug. 28, Mr. Isham Randolph, Chief Engineer, submitted his report on the progress of the work up to Aug. 1. Section 13 was completed July 3. Up to Aug. 1 two-thirds of the entire excavation had been finished, and at the present rate of progress four-fifths will be completed by Jan. 1. Since that meeting of the board section 10, one of the heaviest rock sections, has been finished. Its completion was celebrated by public exercises on Sept. 3. The contract for building the retaining walls on sections 2 and 3 has been awarded to McArthur Bros., for \$3.50 per cubic yard. Representatives of the board will attend the Deep Waterways Convention at Cleveland, Sept. 23.

Advance in Rail Prices.

The Steel Rail Manufacturers' Association, in the latter part of June, advanced the price of rails from \$22 to \$24 a ton. The Illinois Steel Company has at the same time made an advance from \$25 to \$29 per ton. This action has just been supplemented by a somewhat larger advance, the price being raised \$4 in this instance, making the cost of rails now \$28 a ton, f. o. b., Eastern mills. We indicated this advance last week. The price of foreign rails abroad is now \$17.03, to which must be added \$7.84 for duty and \$1.50 for freight, making the price per ton, delivered in New York, \$26.37. The low price of the domestic product recently has practically shut out any foreign trade, but now that the cost of the domestic is \$1.63 above that of the foreign made rail, some competition may ensue. This, however, is rather upset by newspaper reports of cable advices, which quote \$20 a ton and higher as the price now asked by foreign makers.

The Minerva blast furnace in Milwaukee, Wis., has been leased to the Illinois Steel Company, and work at the furnace will be started as soon as possible. The furnace plant, including the six acres of land it occupies, fronts on the Kinnickinnic River just east of the Chicago, Milwaukee & St. Paul, and the Chicago & Northwestern tracks.

Work on the Boston Subway.

Bids have been advertised for and received on Sept. 19 for the building of Section 2 of the Boston subway, which includes the Boylston street station, to be located at the junction of Boylston and Tremont streets. We go to press too early to be able to announce the result of these bids. The steel and iron work is to be erected and put in place by the contractor, although it will be supplied by the Commission. The work embraces about 57,000 cu. yds. of earth excavation, 1,150 tons of iron and steel work, 900 cu. yds. of brick work, 8,300 cu. yds. of concrete masonry, 1,700 cu. yds. of stone work, 5,000 ft. B. M. spruce lumber in foundations and 10,000 sq. yds. of waterproof covering for the subway. The work is to be commenced within 30 days after the signing of the contract, unless the Commission shall authorize or direct a further delay, and is to be completed on or before May 30, 1896.

The Resistance of Rivets.

Some time ago Mr. Dupuy was selected by the Ministry of Public Works, France, to make a special inquiry into the causes of deterioration of metallic structures. Experiments were first made on rivets and a number of conclusions arrived at. A few of them are as follows: Rivets were found to not exactly fill the rivet holes, but to clamp the plates together with a pressure that gives rise to a resistance to sliding equivalent to a weld, which resistance is greater as the limit of the elasticity for rivet material is higher. The effort necessary to shear rivets per square inch of the sections to be sheared is not less than three-fourths of the tensile strength of the rivets per square inch. Mr. Dupuy draws from his conclusions some rules for bridge work, among which are the following: The calculation of riveting cannot be based upon the permissible stress in the test bars, the co-efficients of safety relating to the rivets not depending in any way on those adopted for the bars. A distance apart of 13 ft. is recommended between cross-girders, so as to reduce the stress on rivets. It is further concluded that if the secondary stress on rivets is not calculated and allowed for, the rivets may be expected to yield. In bridges of several spans continuous girders are to be preferred where there is no danger of settlement. With continuous girders the length of each boom from pier to pier does not appreciably change and the riveting of the cross-girders and rail bearers is therefore less strained by the deformation of the bridge. This continuity should not extend over too many spans, as otherwise the efforts necessary to produce movements resulting from temperature changes become excessive. It is further concluded that in girders whose booms have a single web, and in those not horizontally braced above and below, vertical stiffeners are desirable.

Work on the Jerome Park Reservoir.

Work has begun on the Jerome Park reservoir, New York, over 500 men being now engaged in excavating for the foundations of the core walls of the embankments. This force will shortly be supplemented by the addition of 800 negroes, who are to be brought over from Baltimore to carry on the work.

The Suwanee Canal.

The canal of the Suwanee Canal Company has been built primarily for the purpose of removing the timber on the very large body of land in the southeastern portion of Georgia, known as the Okefenokee Swamp—and, secondarily, for the purpose of reclaiming the land. The timber is mainly cypress and pine, cypress in the hammocks and bays, and pine on the islands. The area is

about 40 miles in length, by about 35 miles in width, about half of which is heavily covered with timber. The canal is being constructed east and west, east towards the St. Mary's River, and west through the swamp. The dredge boats are now about half way across the swamp, and valuable timber is being brought out. A mill has been constructed on the eastern margin of the swamp, which is rapidly converting this timber into lumber. No pine in any considerable quantity will be cut until the canal reaches some one of the large islands in the swamp. No effort has yet been made in this direction on account of the exceedingly low price of pine lumber. Cypress has held its price all during the panic, and there is some margin of profit in manufacturing that; hence the general course of the canal has been directed to reach bodies of cypress. There are also in the swamp large bodies of red bay, white bay, mahogany bay, white holly, etc., also some maple and some cedar. This vast wilderness has never been thoroughly explored, and what other timbers will be found cannot be foretold. The canal is about 40 ft. wide, and from 6 to 10 ft. deep. Upon it are at work two dredge boats, two steamboats, and a number of lighters. A railroad has been constructed from Camp Cornelia, the eastern margin of the Swamp, to Folkston, a station on the Savannah, Florida & Western Railroad, about 42 miles north of Jacksonville. The product of the Swamp can be carried to the Atlantic Ocean by the St. Mary's River, or to any point in the West by the railroad system with which the road above referred to connects. The company will commence selling the lumber this month, as its first cut is sufficiently dry for that purpose. It is estimated that there are about 300,000 acres covered by timber. The work has been going on for four years.

Lighting Postal Cars by Electricity.

At the close of 1893 there were in the Royal Post District, Germany, 1,578 railroad post-cars, besides 906 cars hired from the railroad companies, in all 2,484 vehicles. The introduction of electric lighting in all these cars was a matter of considerable importance. The method principally considered seems to have been the storage battery system. After some experiments a form of accumulator was determined upon, which, after feeding eight 12 c. p. lamps for 24 hours, in all 192 lamp hours, fell, in potential, from 32 volts to 30 volts only. From 8 to 11 of these lamps took the place of from 11 to 14 gas lamps, and at the end of 1894 a total of 405 post cars had been fitted with electric lights and 204 more ordered to be so fitted. The batteries contained 16 cells, with a gross weight of 475 lbs. The average charge and discharge current was six amperes, the capacity of a battery 120 ampere hours. The first cost of these batteries was \$115 each. Each group of four glass cells is contained in a wooden box, the space between the cells and the box being filled with a combination of paraffine, asphalt, etc. Sixteen cells form a battery. No short circuiting has occurred. Glow lamps of the Sirius type have proven the best. At 30 volts they give 12 c. p., and their average life is 211 hours each. These lamps cost about 25 cents each. Including the battery the cost for each car is about \$200, which is just about what the gas installation costs. This is for a car about 39 ft. long. For a car 47 ft. long the electric installation costs a little less than the gas and is in this case 1,210 lbs. less in weight. The saving, which has been estimated by Mr. Pohl, from whose article upon the subject this note is abstracted, is about 21 per cent. over the use of gas.

Lubrication Experiments on the Paris, Lyons & Mediterranean.

This road in 1871 abandoned grease for colza oil for axle lubrication, and up to 1885 used this oil pure in summer with 10 per cent. of shale oil in winter, using bronze bearings. At this time and for several subsequent years experiments were made in the use of white metal bearings and mineral oil, also in the substitution of wool for cotton in lubricating wicks. Tests were made to compare the results of using. First, white metal bearings lubricated with mineral oil; second, bronze bearings with mineral oil; third, bronze bearings with colza oil. The tests resulted as follows:

Lubricating Wicks.—A facility in delivering oil of 50 per cent. to 100 per cent. in favor of the woolen wicks was shown. The renewals of woolen wicks were only 68 in number to every 100 of cotton ones, and the former were found to take fire less easily. Although higher in price they have been adopted and exclusively used on this road since 1893.

Bearings.—The tests showed that the wear of white metal bearings was 50 per cent. less than that of bronze bearings. A diminution of 20 per cent. was found in resistance of fully loaded coal wagons at a speed of from 16 to 26 miles an hour in trains of 300 tons, which gain diminished as the speed increased. As a result in 1893 the P., L. & M. abandoned the use of bronze bearings for those of white metal.

Lubricants.—These tests justified fully the previous substitution of oil for grease. The latter gave for isolated carriages with bronze bearings an increase of resistance per ton of 25 per cent. compared to mineral oil, and 40 per cent. compared to colza oil, at 19 miles an hour, and 3 per cent. compared to mineral oil and 14 per cent. compared to colza oil for 38 miles an hour. This would be greater with trains than with isolated cars. Colza oil was thus found to be more advantageous than mineral oil, and, mixed with 10 per cent. of shale oil, appeared to be very nearly equal to the pure oil. It was also found that in summer the consumption of colza oil was only 0.8 of that of mineral oil. As a result of the tests

the P.-L.-M. abandoned mineral oil in 1891 and adopted colza oil with an addition of 10 per cent. of shale oil for exclusive use. It is estimated that the company spent in 1890, \$3,200,000 for coal and used 766 tons of lubricants. Had mineral oil been used \$320,000 more would have been spent on coal and \$61,250 less on oil, showing the economy of using the more expensive oil.

THE SCRAP HEAP.

Notes.

Extensive forest fires raged in Southern New Jersey for several days last week.

The Muir Tunnel on the Northern Pacific, near Livingston, Mont., took fire on Sept. 13 and had to be sealed up. Passengers were transferred over the mountain.

The strike of the iron ore miners in Northern Michigan, which has now been in force ten weeks and has caused a great falling off in ore shipments, is about ended, the strikers being practically beaten.

The Southern Railway has issued a circular directing that employees who have been in its service for a period of one year or more, shall be given leaves of absence and passes to Atlanta, to attend the Exposition, for themselves, their wives and dependent children.

The latest innovation in the excursion business is on the Union Pacific, Denver & Gulf. An official photographer is sent out with each excursion party, and a group photograph is taken at "scenic points," each excursionist being presented with a copy of the photograph.

At Midland City, O., the Baltimore & Ohio Southwestern, experiencing considerable difficulty in getting water for engines, has decided to build a reservoir. It will be at Westboro, 1 3/4 miles from Midland City. A creek will be dammed so as to form a reservoir with a capacity of 22,000,000 gals.

On one division of the Pittsburgh, Cincinnati, Chicago & St. Louis, the "chain gang" plan of running freight engines, that is, the plan of keeping engines on the road as constantly as possible, without regard to the order in which the enginemen run, each man taking the engine most readily available for him, has been suspended or abolished to the extent that a good many of the freight engines have had regular runners assigned to them: whether one, two or three we are not informed.

Some Items from a Railroad Inventory.

Railroads in their natural course become the owners of a very great variety of things; but when they go outside of the business of transportation, there is scarcely any limit to the chattels which they may possess. A *bona fide* inventory of one company's property enumerated, among other things:

- 1 palace window.
- 1 vampire trap.
- 19 crutches.
- 2 broken images.
- 3 temptation banners.
- 224 pairs brass bracelets.
- 1 blue demon shirt.
- 10 demon skirts (short).
- 15 sets ladies' armor.
- 4 rolls silver shower.

The reader by this time has probably guessed that this is from an inventory of theatrical properties, and that they came into a railroad inventory when the Erie was proprietor of the Grand Opera House, which was, we believe, under the management of the late lamented James Fisk Jr.

Venezuelan Concessions.

The Orinoco Company has been incorporated in Washington State to develop the Orinoco concession granted by Venezuela to C. C. Fitzgerald. This concession is said to include 14,000,000 acres of land in the Delta of Orinoco, Venezuela, and on the island called Penales. Projects for extensive railroad construction are involved. The incorporators are Donald Grant, Faribault, Minn.; D. C. Corbin, Spokane; W. H. Lowell, New York; J. A. Bowman, New York; Wm. Glassford, New York; Francis Rose, Faribault, Minn.; and W. H. Morrison, Seattle, Wash.

A Glass Water Cooler.

Mr. A. Major, 461 Pearl street, New York, whose ice float for water coolers we have described, has now brought out a glass water cooler. The combination of the glass cooler and the ice float looks very attractive and has some advantages which make it worth consideration.

A Projected Mountain Road.

J. B. Stetson, President of the North Pacific Coast Railroad, is now in the East examining the White Mountain rack road with a view to the use of the system on the new road to be built to the summit of Mt. Tamalpais, a few miles north of San Francisco.

How it Looked to a Space Writer.

An experimental train, consisting of five cars, ran through this city at 7:30 o'clock yesterday morning, to break the record of fast time, and those who witnessed the passage of the big engine 870 over the several crossings near the switch tower say it was the most thrilling spectacle they ever saw. The gates were down at the crossing 15 minutes before the experimental train came along, and when it shot over the crossings it was under a full head of steam and going at the rate of a mile a minute. The engine tilted over in rounding the curve until the driving wheels on her right side cleared the track fully 8 in. The tender, after striking the crossing, went over, riding on the rear truck, the forward wheels being lifted from the track. The several spectators who saw this agree that they thought the engine was going off the track. The fireman had to hold on for dear life to prevent his being thrown from the cab by the swaying of the engine. It was the most thrilling run of a train they ever saw, and there is not one of them who wants to see the experiment tried again.—*Hudson (N. Y.) Republican*.

Can it be that Brother Daniels could encourage such awful conduct on the part of No. 870 just to advertise the "greatest railroad on earth"? We should doubt the story about the driving wheels, were it not for the fact that similar occurrences (on down grades) have been testified to by veracious freight brakemen from time immemorial. The brakemen's stories, to be sure, always referred to stock trains, and the event always oc-

curred about 2 a. m., when there was no moon; but the fact that the brakeman always lived to tell the tale is evidence, if any were needed, that his story was all right. But the main cause for anxiety in the Hudson case is the delay to those farmers who had to wait 15 minutes before they could cross the track. What will be their opinion of Mr. Daniels and his abolition of stop overs and other oppressive measures? What if they should become so incensed as to level off the Catskills and spoil the Central's summer passenger business?

The American Association for the Advancement of Science.

If we may judge by the recent meeting, at Springfield, the American Association for the Advancement of Science is in danger of becoming sort of a crank hospital. Many wise men attend the meetings and many good papers are read and reasonable discussions had, but doubtless an immense amount of nonsense occupies the time which any sensible man could spend to better advantage.

One of the papers presented was by Mr. H. N. Ogden on Economy of Engineering Public Works. He said that four States now refuse to give the right of eminent domain to railroads; that the Supreme Court of New York had decided that no electric railroad may be constructed parallel to a steam railroad unless it is proved that public necessity and convenience require it. Heavy and bulky freight can be carried cheaper by canal than by rail, and Mr. Ogden thinks that it would be better to restrict the railroads to the transportation of things where rapid delivery is important, and that everything else should be entrusted to the canals. A deep water canal from Chicago to New Orleans for example would give cheap transportation and be of national benefit.

Mr. J. L. Cowles read a paper on the Equality of Opportunity. He proceeded to show that the ordinary laborer cannot get outside his immediate neighborhood to find employment or to educate his children or to spend his earnings because transportation charges are so high. He cannot afford to pay two cents a mile to the steam railroads or 5-cent fares to the electric cars. Mr. Cowles proposes, therefore, that all railroads, telegraphs and telephones should be made free and supported by general taxation. To begin with, systems of transportation and communication should be put under control of the postoffice, making ordinary travel and ordinary use of the telegraph and telephone free and determining tolls for special services and for transportation on postal principles; that is, carry a passenger to any part of the United States for say 10 cents.

It was decided to meet next at Buffalo, on Monday, Aug. 24, 1896. Some of the officers elected were: President, Edward D. Cope, of Philadelphia; Vice-Presidents, A., mathematics and astronomy, William E. Story, of Worcester; B., physics, Carl Leo Mees, of Terre Haute, Ind.; C., mechanical science and engineering, Frank O. Marvin, of Lawrence, Kan.; Permanent Secretary, F. W. Putnam, of Cambridge; General Secretary, Charles R. Barnes, of Madison, Wis.; Secretary of the Council, Asaph Hall, Jr., of Ann Arbor, Mich.

The Manchester Ship Canal.

The canal seems to have produced at least one marked change in the currents of traffic. The reports of the amount of freight carried through the canal have been so discouraging that many of the people have been curious to know whether it would have any effect at all on existing railroad lines, at least for the present; but, according to *Transport*, the shipping trade at Hull has already felt a decided loss, and this in spite of prompt efforts to retain the traffic. Hull is on the east coast about 80 miles from Manchester, and the complaint is that goods heretofore brought by vessels to that port for Manchester now go to the west coast. While the canal is the original cause of this, it appears that the reduction of freight rates by the railroads parallel to the canal is a factor in the matter, some of the freight which Hull has lost being discharged from the vessels at Liverpool.

South American Notes.

Official returns of the operation of the Central Railroad of Brazil (state owned) for the year 1894 show gross receipts amounting to 25,943,081 milreis (m. r. averaged about 22 cents), being a gain of more than one million milreis over receipts for 1893. The number of passengers carried was 12,074,277, and the freight moved amounted to 745,699 tons. The length of road open at the end of 1894 was 229 miles.

President Uripuru, of Argentina, has declared the ports of Patagonia open to commerce without restrictions in order to facilitate the development of that region. Large sheep ranches have been established in many parts of lower Patagonia, mostly under the control of Scotchmen.

The personnel of the newly appointed Argentine National Railroad Board is as follows: President, Carlos Maschwitz, C. E.; Directors, Carlos Stegmann, C. E.; Dr. Rafael de los Llanos, Sr. Lisandro Olmos, Dr. Luis F. Araoz, Dr. Rodolfo N. Zapata and Dr. Carlos Estrada. The Amazon Steam Navigation Co. has placed orders for four steamers, fitted with all modern improvements, to be put in service by January next.

It is stated that the new company organized by Mr. S. B. McConico to complete the railroad from Girardot to the Rio Magdalena in Colombia, to Bogota, has secured a large part of the funds required for building the first section, and that work has begun. This line will be 93 miles long, of which 25 miles has already been constructed. This will open up the thickly populated central plateau of the country, and largely increase the traffic of the Republic. One important advantage which the new road will afford is that through bills of lading can be obtained from the port of Cartagena over the Cartagena & Magdalena Railroad (built by Mr. McConico) to Calamar on the river, and thence up the river to Girardot and on to interior points.

CAR BUILDING.

The Union Pacific Road last week placed with the Ensign Car & Mfg. Co., of Huntington, W. Va., an order for 40 new grain and fruit cars for delivery by Oct. 15. The Ensign Company is well employed in all departments.

BRIDGE BUILDING.

Hartland, N. B.—The Canadian Government engineers have been examining the site for a new steel bridge across the river at this point.

New Westminster, B. C.—The Buller Bridge Company of Pueblo, Col., has been awarded the contract to construct a bridge across the Fraser River at New Westminster. The estimated cost is \$400,000.

Providence, R. I.—Sealed proposals for building two steel highway bridges were to be opened on Thursday of this week by the Commissioner of Public Works at

Providence. One structure is to replace the present bridge at Exchange place over the Providence River and the second is to cross the Moshassuck River at Promenade street.

Santa Maria, Cal.—The Southern Pacific has completed the long steel bridge on its new coast division at Santa Maria, Santa Barbara County, Cal. The structure is 1,250 ft. long, has seven spans and cost over \$150,000.

Southern Pacific.—The company has recently begun extensive and costly improvements in its bridge system among the California mountain ranges and many wooden structures that have stood for years are being replaced by spans and by bridges composed of both wood and steel. Some of these bridges have cost from \$40,000 to \$50,000. The bridges at Cape Horn and Cascades in the Sierra Nevadas, as well as a number in the Tehachapi and Siskiyou ranges, have recently been rebuilt entirely of steel, while the wooden bridge across the Sacramento River at Sacramento has been replaced by a steel and wooden structure. These improvements will be continued until the entire system is equipped with modern bridges.

RAILROAD LAW—NOTES OF DECISIONS.

Carriers of Goods and Injuries to Property.

In Minnesota a box of merchandise was left in defendant's railroad car, in which it was transported, and, over 48 hours after the car arrived at the place of consignment, was stolen from the car. It did not appear that there was any special reason for leaving the box in the car, or that there was any custom or agreement to deliver such packages to the consignee directly from the cars. The Supreme Court rules that defendant's liability as common carrier had not terminated.

In the Federal Court it is held that the axle of a railroad car is a part of its machinery, within an exception, in a bill of lading, of "accidents to boilers or machinery."

The Supreme Court of Texas holds that where a contract for the shipment of live stock requires the shipper to give notice in writing of any claim for damages to some general officer of the carrier, or to its nearest station agent, within one day after the delivery of the cattle, and before they are removed, slaughtered, or intermingled with others, the burden is on the carrier to show that it afforded the shipper reasonable facilities to comply with the contract; and where the cattle are delivered in a large city, in which it is doubtful whether the carrier has an officer known as the "station agent," it should also appear that the shipper knew what was meant by the term "general officers," and that they were so accessible that he could have reached them, by the exercise of reasonable diligence, within the required time.

In Kansas it is held that a contract for freight from a point out of the state for a rate less than that charged other persons, where the usual rate is not unreasonable, is void under the interstate commerce act, though made by an agent by mistake.

In Mississippi it is ruled that in an action against a railroad for damages for refusing to deliver goods, mere brusqueness on the part of the agent, not amounting to insult, is not a ground for punitive damages.

In Tennessee it is held that where a railroad track passing through a town is intersected by streets and alleys actually opened or dedicated by plat to public use, the statutory duty to fence does not apply.

In Kentucky it appeared that plaintiff's house was 240 ft. from the track, and that on the day of the fire a heavy freight train went by at 11 o'clock, but that the fire was not discovered till 12:36 o'clock; and that the only fire about the house that day was in the cook room, some 40 ft. from where the house took fire. A strong wind was blowing. Several experts for defendant testified that the engine of the freight train was provided with the most improved spark arrester, and that sparks or cinders could not be carried in a live condition, through the air, so as to set fire to buildings at such a distance. It is ruled, that a verdict for plaintiff should have been set aside.

The Supreme Court of Missouri decides that a railroad is not negligent because it fails to fence its freight yard.

In Texas, where a railroad negligently permitted its right of way to become overgrown with grass, which caught fire from sparks from the company's engine and communicated the same to plaintiff's grass, it is liable, no matter how perfect its spark arresters may have been.

In Texas a railway is not relieved of liability for cattle killed by its trains from its failure to fence its right of way because the owner of the cattle, whose land adjoins the railroad, maintains a fence between his pasture land and the right of way.

In Michigan it is ruled that where defendant's servants placed debris gathered from tearing down a wooden platform in a ditch on the right of way between the tracks and plaintiff's planing mill, and partly covered it with sawdust and shavings, and on plaintiff's stating that the material so placed formed a fire trap, defendant promised to cover it up, and did so partly, and plaintiff subsequently visited the premises and saw their dangerous condition, but left town without taking steps to protect his property, and the fire which subsequently destroyed it originated on that part of the debris not covered up by defendant, a charge that plaintiff was negligent was properly refused.

Injuries to Passengers, Employees and Strangers.

The Supreme Court of Texas decides that where a passenger carried alcohol on a train, without the company's knowledge, and negligently spilled it, and before it could be removed from the car floor another passenger carelessly threw a match into it and a third passenger was burned in consequence, the last cannot recover, although the conductor negligently permitted the sack in which the alcohol was carried to project over the arm of the seat into the aisle.

In Missouri, one A, in alighting at night from a car on a dummy line, with the operation of whose trains he was familiar, was struck by a train on the opposite track and killed. The train on which he rode had just passed his station, but was coming to stop when he got off. The conductor, however, lighted him off at the steps. Held, that A was not, as a matter of law, guilty of contributory negligence, though, if he had looked, he might have seen the approaching train.

In Nebraska it is evidence of negligence on the part of a street railway company to carry passengers greatly in excess of the seating capacity of its trains, and to permit them to stand on the platform and steps of the cars.

In Texas it appeared that plaintiff had paid his fare, and was standing on the lower step of the coach just as the train started, when he was kicked off by the train porter; that he had but one hand, with which he clung to the car railing, expecting the train to stop, and was dragged some distance. It is held by the Supreme Court that, although plaintiff was drunk at the time, a judgment in his favor was warranted.

In Pennsylvania it is held that in an action by a passenger pushed off a crowded platform, evidence that he got on the car in reliance on the conductor's statement that there was room inside, that on getting to the door he found the car so crowded as to prevent his pushing his way in, and that he was prevented from leaving the platform, before the train started, by other passengers crowding up behind him, is sufficient to warrant the jury in finding defendant guilty of negligence.¹⁴

In Iowa a railway voluntarily furnishing a hospital for the treatment of its employees in case of injury is not liable, provided it employ competent surgeons, for their malpractice.¹⁷

In Texas a section hand who bases his claim solely upon the negligence of those in charge of a train which collided with a hand car cannot urge as a ground of recovery the negligence of the foreman of the section gang if he does not plead it.¹⁸

In Alabama an engineer on an engine used in shifting cars to a sidetrack assumes the risk of obvious defects in the engine and trestle, so as to preclude a recovery for his death, caused by his losing control of the engine, and its running at great speed onto a high trestle, and tearing up a stop block at the end, and being precipitated over the brow of a steep hill.¹⁹

In Texas, plaintiff, the only witness of the accident, testified that in attempting to couple a car to the head end of the engine, while standing on the pilot, the engine being in motion, he tried to raise the drawbar attached to the engine; that at the first attempt he failed to use sufficient strength, but making a greater effort, the bar, which weighed about 70 pounds, suddenly came up, causing him to lose his balance and to fall beneath the pilot. There was no evidence of any defect in the drawbar. The Supreme Court rules that a verdict for defendant was proper.²⁰

In Iowa it is held that the kicking of cars within city limits at a rate of speed prohibited by ordinance, without any one being stationed near at hand or on them to check the speed or give warning of their approach to men working on a parallel track, is negligence per se, so as to render the company liable for injuries to a track repairer who was struck by them just after he had stepped off the track on which he was working, to let an engine pass, and who was himself without fault contributing to the accident.²¹

In Texas a violation of the company's rules, by propelling a train at a greater rate of speed than permitted by them, is not, of itself, contributory negligence on the part of the engineer.²²

In Iowa, to suddenly, and without notice, increase the speed of an engine, after it has been reduced in response to the signal of a brakeman about to couple it to a car, and without his orders, is negligence.²³

In Texas, plaintiff, a truckman of defendant, subject to the orders of D., was by the latter placed temporarily under the direction of C., a foreman in defendant's stockyards, to assist in putting into a pen a steer which C. knew to be vicious, but concerning which plaintiff had no knowledge; and, not being provided by C. with sufficient help to control the animal, plaintiff was injured. The Supreme Court holds that C. was negligent in not notifying plaintiff of the danger.²⁴

In the Federal Court where a brakeman is injured by the breaking of a defective coupling pin, the fact that he was at the time on top of the car, when he should have been on the ground beside the car, does not constitute contributory negligence.²⁵

In Iowa, an employee who, knowing that men inside a box car, unloading ties, had not been warned of his approach, attempted to pass near the car without cautioning the men, and was struck by a tie, was guilty of contributory negligence, though his orders required him to pass the car and to "hurry."²⁶

In Alabama, the fact that a railroad negligently maintains for many years a bridge over its tracks, so low as to require a brakeman standing on a freight train to stoop in order to pass under it safely, does not constitute willful, wanton, or intentional negligence, although the bridge could be elevated at small expense, and without public inconvenience.²⁷

In the Supreme Court of the United States it is laid down that a corporation is not to be held as guarantying or warranting the absolute safety, under all circumstances, or the perfection in all its parts, of the machinery or apparatus which may be provided for the use of employees; its duty in that respect being discharged when its agents, whose business it is to supply such instrumentalities, exercised due care, as well in their purchase originally, as in keeping and maintaining them in such condition as to be reasonably and adequately safe for use by employees.²⁸

In Kentucky, an employee cannot recover from a railroad company for injuries caused by the breaking of a handle of a hand car by reason of defects in that portion of the handle which is fastened in an iron socket, and which cannot be discovered without removing it from the socket, in the absence of proof that the company had actual knowledge of this defect.²⁹

In Missouri it appeared that prairie grass 6 or 7 ft. tall grew on defendant's right-of-way to within 6 ft. of the track, and the approach to the track began in a mud-hole, in which there was a wagon wreck, making it necessary for deceased to drive nearer the tall grass than ordinarily, and upon lower ground. Deceased, who was hard of hearing, was elevated some 5½ ft. by his wagon box and seat, and the train, approaching on a level track, was distant 150 ft. from the crossing at the time deceased was at the point to which he must have driven to pass the wagon wreck, which was 15 or 30 ft. from the crossing. He was driving about three miles an hour, and the train was approaching at a speed of 30 miles an hour. The Supreme Court decides that the evidence showed deceased negligent in not looking for an approaching train over the grass.³⁰

In New Jersey it is held that a notice by a railroad and the Superintendent of the Mail Service, as to throwing mail from moving trains, reciting that "this does not in any way relieve baggage masters and mail agents from using all possible precautions against liability of injuring any one in throwing off mail," does not render the railroad company liable to one injured by the negligence of another in the service of the government in throwing off mail.³¹

In Kansas a railroad company is liable for injuries to a team of horses that, in running away, collides with a train at a crossing, where the collision would not have occurred if gates had been placed by the company at the crossing, as required by a city ordinance.³²

In Nebraska the mere fact that a man is found dead under a railroad car does not raise the presumption that he came to his death through the negligence of the railroad company.³³

In Vermont plaintiff, who had often been obliged to wait from 5 to 25 minutes through a like obstruction, testified that having waited 15 minutes, and being in a hurry, though there was no necessity for him immediately to cross, after stepping back and looking up and down the track to see if an engine was in sight, and not seeing one, though he could not see very far up the track on account of a curve, he attempted to follow

several other persons who passed between the cars by climbing over the bumpers. A city ordinance prohibited the blocking of streets for the length of time the highway in question had been blocked. Plaintiff, while between the cars, was injured through the sudden coupling of the cars by an engine. Defendant's evidence showed that the train crew were attending to their duties, and did not see plaintiff, one being at each end of the cars, and the others on the engine. The Supreme Court holds that plaintiff was guilty of such negligence as precluded a recovery.³⁴

- ¹ Kirk v. C., St. P. M. & O. Ry. Co. 60 N. W. Rep., 1084.
- ² Fairbank v. C., N. O. & T. P. Ry. Co., 66 Fed. Rep., 471.
- ³ M. Pac. Ry. Co. v. Childers, 29 S. W. Rep., 559.
- ⁴ C. R. L. & P. v. Hubbell, 38 Pac. Rep., 366.
- ⁵ Ill. Cent. v. B. Mach. Co., 16 South. Rep., 252.
- ⁶ Hughes v. N. C. & St. L. Ry. Co., 29 S. W. Rep., 723.
- ⁷ L. & N. v. Mitchell, 29 S. W. Rep., 580.
- ⁸ Barney v. H. & St. J., 28 S. W. Rep., 1069.
- ⁹ G. H. & S. A. v. Polk, 28 S. W. Rep., 333.
- ¹⁰ San A. & A. P. Ry. Co. v. Peterson, 27 S. W. Rep., 969.
- ¹¹ Briant v. D. L. & N., 62 N. W. Rep., 365.
- ¹² G. C. & S. F. Ry. Co. v. Shields, 29 S. W. Rep., 652.
- ¹³ McDonald v. K. C. & I. (Mo. Sup.), 29 S. W. Rep., 848.
- ¹⁴ Pray v. Omaha St. Ry. Co., 62 N. W. Rep., 447.
- ¹⁵ T. & P. Ry. Co. v. Edmond, 29 S. W. Rep., 518.
- ¹⁶ Dennis v. P. & C. S., 31 Atl. Rep., 52.
- ¹⁷ Eighmy v. U. P., 61 N. W. Rep., 1056.
- ¹⁸ Int. & G. N. v. Arias, 30 S. W. Rep., 446.
- ¹⁹ L. & N. v. Stutts, 17 South. Rep., 29.
- ²⁰ Johnson v. G. H. & S. A., 30 S. W. Rep., 95.
- ²¹ Tobey v. B. O. R. & N., 62 N. W. Rep., 761.
- ²² G. C. & S. F. Ry. Co. v. John, 29 S. W. Rep., 538.
- ²³ Strong v. L. C., 62 N. W. Rep., 739.
- ²⁴ Int. & G. N. v. Smith, 30 S. W. Rep., 51.
- ²⁵ T. H. & I. v. Mansberger, 65 E. Fed. Rep., 195.
- ²⁶ Thomas v. C. & N. W. Ry. Co., 60 N. W. Rep., 612.
- ²⁷ L. & N. v. Banks, 16 South. Rep., 547.
- ²⁸ B. & P. v. Mackey, 15 S. Ct., 491.
- ²⁹ L. & N. v. Hinder, 30 S. W. Rep., 399.
- ³⁰ Hayden v. M., K. & T., 28 S. W. Rep., 74.
- ³¹ Penn. v. Russ, 30 Atl. Rep., 524.
- ³² Miss. P. Ry. Co. v. Hockett, 35 Pac. Rep., 294.
- ³³ Spears v. C. B. & Q., 62 N. W. Rep., 63.
- ³⁴ Magoon v. B. & M., 31 Atl. Rep., 156.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Milwaukee & St. Paul, \$3.50 per share on the preferred stock and \$1 per share on the common stock, payable Oct. 21.

Manhattan Railway Company, quarterly, 1½ per cent. on the capital stock, payable Oct. 1.

Sunbury & Lehigh Valley Railway Company, semi-annual, 4 per cent., payable Oct. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Boston & Albany, annual, Boston, Sept. 25.

Canada Atlantic, annual general, Ottawa, Sept. 24.

Chesapeake & Ohio, annual, Richmond, Va., Oct. 22.

Chicago, Detroit & Canada, annual general, Detroit, Mich., Sept. 25.

Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 21.

Michigan-Penninsular Car Company, 184 La Salle street, Chicago, Ill., Oct. 1.

Minneapolis & St. Louis, annual, Minneapolis, Oct. 1.

Ottawa, Arnprior & Parry Sound, annual general, Ottawa, Sept. 24.

Pittsfield & North Adams, annual, Boston, Sept. 25.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American International Association of Railroad Superintendents of Bridges and Buildings* will hold its annual meeting at New Orleans, La., Oct. 15.

The *American Street Railway Association* will hold its annual meeting at the Windsor Hotel, Montreal, Oct. 15 to 18.

The *Roadmaster's Association of America* will hold its annual meeting at St. Louis, Mo., Oct. 15, 16 and 17.

The *American Railway Association* will hold its fall meeting at New York City, Oct. 16.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Westeyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Rvan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets on the first Tuesday in each month, at 8 p. m. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago. The business meetings are held on the first Wednesday at its rooms. The meetings for the reading and discussion of papers are held on the third Wednesday at the Armour Institute, Thirty-third street and Armour avenue.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Westeyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 5 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 383.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. B. W. Gardner, Monadnock Block, Chicago, is secretary of the association.

The *Association of Civil Engineers of Cornell University* meets on Friday of each week at 2:30 p. m., from October to May, inclusive, at its association rooms in Lincoln Hall, Ithaca, N. Y.

Civil Engineers' Club of Cleveland.

A meeting of the Civil Engineers' Club of Cleveland was held in the rooms of the club, Case Library Building, Tuesday, Sept. 10, 1895. Mr. F. S. Barnum presented the paper of the evening, entitled, "Educational Architecture." After the meeting a light lunch was served.

International Deep Water-Ways Association.

The Deep Water-Ways Convention held at Toronto last year, resulted in the organization of the International Deep Water Ways Association, and the first convention of this body is to be held at Cleveland, O., Sept. 24, 25 and 26. Hon. F. G. Flower, of West Superior, Wis., is the Executive Secretary.

Young Men's Christian Association.

The eighth International Railroad Conference was held at Clifton Forge, Va., last week. About 500 delegates were present on the first day, Mr. C. F. Cox, Vice-President of the Canada Southern, being Chairman of the meeting. An address was delivered by Rev. Theron Rice on the Spiritual Life of Railroad Men, and in the evening there was an address by President M. E. Ingalls, of the Chesapeake & Ohio. Mr. Ingalls' road has been one of the most prominent in the country in supporting the Young Men's Christian Associations.

The Institution of Civil Engineers.

Mr James Forrest, Secretary of the Institution of Civil Engineers, Great George street, Westminster, S. W., has sent out a circular asking for original contributions on a given list of subjects. The list is merely suggestive and does not purport to be in any sense exhaustive. The Institution has special funds for the award of a number of premiums and medals. We do not print the list of subjects, as it is pretty long, covering as it does 66 subjects. Doubtless, copies can be had by addressing the Secretary as above. The same circular contains a list of premiums awarded during the session of 1894-95. We do not find in this list one name of an American member of the Institution and we hope that in the current year some of the premiums and medals will come to this country.

Local Ticket Agents' Convention.

The International Association of Local Ticket Agents met in Boston Sept. 11-12. Active membership in this association is confined to authorized coupon ticket agents in charge of coupon ticket offices of steam transportation companies and the bonded assistants in coupon offices. There are about 1,500 members, and the attendance at this convention was about 600. The by-laws were amended, one change being that any member found guilty of violating the courtesy extended by railroad or steamboat lines shall be expelled, and, if the offense is thought to warrant it, the offending member shall be reported to the general officers of the road by which he is employed.

The following officers were elected: President, W. H. Lohmiller, of La Crosse, Wis.; Secretary and Treasurer, Charles G. Cadwallader, Broad Street Station, Philadelphia; Assistant Treasurer, Ellwood Ramsey, Philadelphia.

American Society of Civil Engineers.

At the meeting of Sept. 4, 1895, a paper by A. McL. Hawks, Jun. Am. Soc. C. E., entitled, "A High-Speed Gravity Filter Bed," was read by the Secretary, as were also written discussions by Messrs. Allen Hazen, S. Bent Russell, Edmund B. Weston, John W. Hill and Joseph B. Rider, and the subject was discussed orally by Messrs. Rudolph Hering, J. J. R. Croes and Henry C. Meyer.

On the evening of Sept. 18, 1895, John D. Van Buren, M. Am. Soc. C. E., presented a paper entitled, "Notes on High Masonry Dams."

At the meeting to be held Oct. 2, 1895, a paper by Ernest C. Moore, Jun. Am. Soc. C. E., on "Moving Two 36-in. Water Mains Without Shutting Off the Water," will be presented. An abstract follows:

MOVING TWO 36-IN. WATER MAINS WITHOUT SHUTTING OFF THE WATER.

During the construction of the Lexington Avenue Cable Railroad in New York City it became necessary for the engineers of the Metropolitan Street Railway Company to move two 36-in. cast-iron water mains without shutting off the water. These mains were 9 ft. lengths. They had to be dropped about 2 ft. and moved sideways about 1 ft. for a distance of 100 ft., and for the same distance on either end of this section there was some shifting of position, so that the change in direction in passing from the old to the new location might be as gradual as possible.

The first work was to erect a yoke over each joint, from

which the pipes could be hung by a chain and turn-buckles. The yokes were of 8 x 12-in. yellow pine, the posts being 8½ ft. long, set on a wooden foot block of 5 x 12-in. yellow pine 2 ft. long, and the cap piece was about 11 ft. long, being 9 ft. between the posts. The cap was laid on top of the posts without framing, and fastened to them by 2 x 9-in. spruce cleats about 2 ft. long, one being nailed at each post and on opposite sides of the bent. Then a diagonal brace of 2 x 9-in. spruce about 3 ft. long was nailed diagonally from the cap to each post on the opposite side to the cleat.

As soon as the first bent was set up and braced from the ground, the next bent was set up, and the two were fastened together by nailing two pieces of 2 x 9 in. spruce on top, reaching from one bent to the other at the ends, and so on until 20 bents were in place. Then the chains, which were of ½-in. round iron, with links 7 in. long on the inside, were put in place. The part of the chain which went over the yoke was 5 ft. long and the part which went under the pipe was 11 ft. long. There were two turn-buckles at each bent, so that the chain would not have to slip around the pipe or cap in lowering. Each turn-buckle was of 1½-in. iron, with hooks on each end, and could lower 12 in. without changing hooks, which were made to just fit in the links of the chain. When the pipe was dropped as far as the turn-buckle would go the latter was taken off in its turn and the hooks placed in links nearer the end of the chain, when the lowering proceeded as before. Everything was made of sufficient strength to allow of every other turn-buckle being taken entirely off without blocking the pipe.

The lateral movement of the pipes was accomplished by hanging the chains over the cap piece, a few inches to one side of a perpendicular through the center of the pipe, and putting a 4 x 6-in. spruce brace from the end of the cap to the bank, to prevent the bent from moving toward the pipe, instead of the pipe toward the bent. At the same time a 2 x 9-in. spruce brace was added at each end of each bent, running diagonally from the top of one to the bottom of the next, and in opposite directions at the opposite ends of the bents. This was done to take care of the torsional strain caused by the cap being at right angles to the pipe.

By beginning at one end, it was possible to lower the first 100 ft. of the pipe into position, and to take down and move ahead the first 11 bents; then, as the pipe came into position, each bent was taken down and moved ahead again. The two pipes lay parallel to each other and 5 ft. apart, center to center. One pipe was lowered at a time. There was one hydrant connection in each pipe, which had to be cut in moving. There were occasional small leaks while the pipes were being lowered, but they generally stopped as the pipe was lowered, and the joint had a chance to come back into place. When the pipes were in place, all the joints were gone over and put in good condition.

The work was carried on day and night and cost \$5,501.71.

PERSONAL.

—The Manager of the Mobile Bureau of Freight and Transportation is Mr. E. E. England.

—Mr. C. H. Middleton has been appointed Assistant Chief Engineer of the Denver & Rio Grande road, with office at Denver, Colo.

—Mr. George D. Haven, who a few months ago left the Chicago & West Michigan road to become editor of one of the Chicago daily papers, has resigned the latter position and has been re-appointed General Passenger & Ticket Agent of the Chicago & West Michigan.

—Mr. B. C. Millner, Jr., has been appointed assistant to Mr. C. H. Hudson, Chief Engineer of the Southern Railway. Mr. Millner has recently been in charge of the civil engineering work of the Cotton States Exposition at Atlanta under Mr. Grant Wilkins, Chief of Construction. He was formerly Chief Engineer of the Georgia, Southern and Florida, and built most of that railroad between Macon and Palatka, Fla.

—Mr. H. M. Norris has recently been appointed Superintendent and Mechanical Engineer of the Riehle Brothers Testing Machine Co., of Philadelphia. Mr. Norris is an engineer of long experience and has been an occasional contributor to technical journals and magazines in this country. Mr. C. E. Buzby, the former Superintendent of the office which he has held for many years, intending to retire from active business. He will, however, retain a connection with the firm as Consulting Engineer.

—Mr. J. M. Turner has resigned the position of Master of Trains of the Central Division of the Seaboard Air Line, comprising the Carolina Central, the Raleigh & Gaston and the Raleigh & Augusta Air Line roads, with headquarters at Raleigh, N. C., and will be succeeded by Johnston T. Busbee, Master of Trains for the Southern Division, with headquarters at Abbeville, S. C., transferred. Mr. Busbee's successor has not yet been named. Mr. Turner resigns from the service of the Seaboard Air Line in order to accept a position as Superintendent of Transportation and Motive Power on the New Orleans & Western, with headquarters at New Orleans. Mr. Turner has had long experience in these positions, having been Superintendent of the South Carolina road and the Southern Division of the Illinois Central.

ELECTIONS AND APPOINTMENTS.

Missouri, Kansas & Texas.—John A. Wrong, Contracting Agent at Sedalia, Mo., has been appointed Local Freight Agent at that town, and George Moore, of the Wabash, at La Plata, has been appointed Contracting Agent.

Nashville Chattanooga & St. Louis.—The annual meeting of stockholders of the railroad was held at Nashville, Tenn., Sept. 11. The old Board of Directors and executive officers were re-elected, Major J. W. Thomas, President and General Manager; J. H. Ambrose, Secretary and Treasurer; J. D. Maney, Comptroller.

New York, New Haven & Hartford.—The directors have chosen Arthur D. Osborn, of New Haven, a director, to succeed ex-Governor Morris, deceased.

Oil City Station.—This is a new company in Pennsylvania, with John B. Smithman, of Oil City, President, and Henry W. Hileman, Benj. F. Slater, Wm. A. Rider, James H. Farbush and Earnest E. Culbertson, directors.

Roanoke & Southern.—At the annual meeting held at Roanoke, Va., Sept. 10, the following officers and directors were re-elected: President, Col. F. H. Fries; Vice-Presidents, H. S. Trout, John Gill and J. H. Spencer; Directors, J. W. Fries, C. H. Fogle, I. L. Vaughn, J. E.

Gilmer, R. J. Reynolds, J. W. Hanes, H. L. Riggins, B. J. Sheppard, P. P. Watson, J. H. Matthews, S. F. Jamison, I. H. Stewart, R. A. Backner, W. M. Semple.

Terminal Railroad Association of St. Louis.—General Manager Joseph Ramsey, Jr., announces the following changes: H. P. Taussig, having resigned as chief engineer, effective Sept. 30, the office of engineer will be abolished on and after that date. J. W. Taylor is appointed Engineer of Maintenance of Way, having charge of all maintenance and repairs of tracks and construction work. N. W. Eays, Superintendent of Structures, will have charge of repairs and renewals of bridges, buildings and platforms and interlocking plants.

The Engineer of Maintenance of Way and Superintendent of Structures will report after this date to the general manager.

Toledo, St. Louis & Kansas City.—The stockholders met at Toledo, Sept. 11, and made some changes in the directory. John P. Morris, of New York, was elected to succeed F. L. Russ of the same city. David Robinson, Jr., a street railroad capitalist of Toledo, takes the place of W. Howard Gilder, of New York, and L. Mills, of Toledo, was elected to succeed S. R. Calloway, the company's former President. The new directory is as follows: R. G. Ingersoll, John P. Morris, J. O. Osgood, J. L. Laidlaw, S. H. Kneeland, S. J. Stout, New York; Charles Miller, Franklin, Pa.; F. J. Sawyer, Buffalo; S. K. Wilson, Trenton, N. J.; M. L. Crowell, F. L. Geddes, A. L. Mills, David Robinson, Toledo. No changes were made in the list of officers.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Albuquerque, Colorado & Pacific.—Incorporation papers will shortly be filed in Denver. W. W. Borst, an experienced railroad man, will be actively identified with the new company.

Arkansas & Choctaw.—This company was recently organized at Little Rock, Ark., to build a road from a connection with the Texarkana & Fort Smith in Little River County, one of the southwestern counties of the state west to the Choctaw reservation. The route is through a very rich cotton land and will give railroad facilities to a number of counties which at present have no rail connection with the rest of the state.

Astoria & Columbia River.—Mr. A. B. Hammond, the projector of this railroad from Astoria along the Columbia River to a connection with the Northern Pacific, stated in a recent newspaper interview that he was now prepared to go ahead with the construction of the line, the Astoria committee having secured the right of way and the local subscriptions of stock called for in his proposition to build the road. The plans of the Young's Bay bridge, an important structure near Astoria, have been completed. The contract for this work and for the tunnel work on the south side of the Columbia River, on the line near Goble, will be given out during the present month.

Belton & Northwestern.—The formal organization of this line has now been completed, and a charter was secured in Texas last week to build from Belton to McGregor, a distance of about 35 miles. The surveys have been made and the projectors have already secured a large amount of local subscriptions which justify the commencement of construction work this season. The new officers and directors were given in last week's issue.

Canadian Pacific.—Contracts for grading and other work will shortly be let for an extension of 13 miles of the Arrow Lake Branch in British Columbia.

Carolina Central.—A correspondent in North Carolina writes us that it is positively stated by railroad officials there that this road, which is operated by the Seaboard Air Line, and a portion of which composes a part of that system's main line between Washington and Atlanta, is to be extended by the Seaboard Air Line from Rutherfordton, N. C., to Spartanburg, S. C., where it will make important connections with South Carolina and Georgia, and more southern points.

Chesapeake & Western.—Engineers are now surveying the line at Culpeper, Va., and through that and adjacent counties, with the object of securing for this road a through route from the coalfields of West Virginia to the ocean. They will deviate from their original route by running a line through Winstonville, a flag station on the Southern Railway, three miles from the town of Culpeper. The place is principally owned by Lucien D. Winston, who has agreed to pay the new company \$10,000 in cash to build the line through Winstonville.

Dallas Terminal Railway & Union Depot Co.—The St. Louis Trust Co. has been made trustee of the first issue of bonds by this company, the amount authorized being \$500,000 running for 30 years. The bonds are a mortgage on all the property of the company, including the road bed, union station and other buildings and rolling stock to be acquired. The construction of the terminal tracks through the city of Dallas, Tex., is now proceeding, but it is not yet possible to know when the road will be completed. It is intended as a belt line through and around the city and to give all the roads entering Dallas an entrance to the Union station. G. Howard Eilers, the well-known engineer, of Chicago, is President of the company, and W. C. Connors, of Dallas, is General Manager.

Depew & Tonawanda.—The surveys for this line have all been made and most of the right of way has been secured between Depew and Tonawanda north of Buffalo. The construction work which was ready to proceed has been delayed by a complication over the purchase of certain land near Depew and by a change of location near that town decided upon by the directors, which will have to be approved by the state courts.

Detroit & Mackinac.—The company has begun the construction of 15 miles of road from Emery Junction to Omer, Arenac County, Mich. This line is common to several surveys which have been made for a future extension to Standish or Linwood on the Michigan Central or to Bay City. The line is a tangent with maximum grades of 20 ft. to the mile and will be laid with 70-lb. rail of the section recommended by the rail committee of the Am. Soc. Civil Engineers. This line opens up a new country, mostly hardwood, and a fine country for farms after timber is gone. The construction will be done by the company's own forces.

Duluth & Northwestern.—Articles of incorporation of this company have been filed in Duluth to build a railroad from Duluth to the Mesaba mining range in Northern Minnesota and to the large producing mines in that district. The new company has been organized by the Merritts of Duluth, who organized the Duluth,

Missabe & Northern road and built most of that line, but in which they no longer hold any considerable interest. Alfred Merritt is President of the new company; A. R. Merritt, Vice-President; Leonidas Merritt, Secretary and Treasurer. The initial capital stock of the road is but \$100,000. The location is made for 23 miles from Duluth, the most expensive part of its line, and the preliminary line has been run to the Mesaba mines. Work is to begin on construction next year, and the line is to be hauling ore by June, 1897. It will closely parallel the Rockefeller line from Duluth to the Mesaba, that being for most of the distance the best obtainable route. The statement that the new line would be particularly a competitor of that road is said by the officers an error.

Lima & Northern.—W. B. Strang & Co., 15 Wall street, New York City, who have the contract for building this road north of Lima, O., toward Lake Erie, will sublet the contracts immediately for the grading, bridging and tracklaying on the first section of 35 miles north of Lima, to the crossing of the Toledo, St. Louis & Kansas City in Henry County. An additional 35 miles to the town of Adrian, Mich., will be let at Lima, O., when the profiles have been completed.

Long Lake.—The application of this company for authority from the New York State Railroad Commissioners to construct a road in the Adirondack region was argued before the Commissioners at Albany last week, but so far no decision has been announced. There was a good deal of opposition to the application, it being argued that the projectors could show no necessity for the construction of the road. The road is projected from Long Lake to Axton and is to connect at the latter place with the proposed Racquette River line which is to extend to Racquette Lake. It was contended at the hearing before the Commissioners that there was no settlement at Axton and only a few houses at Long Lake, and that as the state of New York is to extend the lines of the Adirondack Park to include the district through which the new road is proposed, it would be against the policy of the state to grant authority to build a road through the forests.

Manistig & Northern.—Parker & Robinson will begin work this week on the contract for grading the first section of 20 miles of this road in Northern Michigan. The new line is to extend in a southerly direction from Negaunee to Lake Michigan. The road will traverse the largest belt of untouched hard wood in the upper peninsula, and is to be completed by next spring.

Monongah & Ohio River.—A charter was issued in West Virginia last week to this company to build a road commencing at or near the mouth of the Binghamon Creek, a tributary of the west fork of the Monongahela River between the counties of Harrison and Marion, and extending by way of the valleys of Binghamon and Fishing creeks to the Ohio River at New Martinsville. The principal office will be at Parkersburg, W. Va., and the incorporators are J. N. Camden, Meyer Newburger, H. H. Moss and C. William Armstrong, all of Parkersburg. This is the road, mention of which was made in these columns some months ago, which Senator Johnson N. Camden outlined to connect the Ohio River road, which connects with the Baltimore & Ohio and Pennsylvania at Wheeling, and extends to a connection with the Kanawha & Michigan at Point Pleasant and the Chesapeake & Ohio and Norfolk & Western at Kenova, with the West Virginia & Pittsburgh and Monongahela River roads, which latter tap both the famous Fairmount and Clarksburg coalfields and the timber territory of central West Virginia. The project is of unusual importance, as the road would make a direct outlet by river and rail for Marion County coal to Cincinnati and the West, and at the same time gives to the central West Virginia coal and timber regions competing lines of railroad which heretofore have not existed.

New Roads.—The right of way is now being secured for a road from Timpson north to Carthage, Tex. The grading has been started at Timpson, the southern terminus of the road, and it is expected will be continued rapidly until Carthage is reached. The construction of the new railroad will connect the Texas, Sabine Valley & Northwestern road, which ends at Carthage, with the Houston, East & West Texas road at Timpson, and through that connection give a new and direct outlet from Northeastern Texas to Houston and Galveston.

Oil City Station.—This company was incorporated at Harrisburg, last week, to build a road from the east bank of the Allegheny River south of Oil City by the way of Deep Hollow to the city of Franklin, all the points being within the county of Venango, Penn., and the distance about 9 miles. John B. Smithman, of Oil City, is President.

San Francisco & San Joaquin Valley.—Work on this interior California road is being pushed with vigor, and the first construction gangs have just left Stockton, the northern terminal. Surveyors have about completed their work to Bakersfield, the southern terminus. Over 2,000 tons of rails for the road are now stored at Stockton, and 18,000 tons more are on sea making for San Francisco. Several hundred thousand ties and many thousand piles are also being delivered at Stockton. Bids for lumber for the bridges as far south as Merced, amounting to 1,500,000 ft., were recently accepted. C. A. Hooper & Co., of San Francisco, being awarded the contracts for redwood, and P. A. Buell & Co. and the Stockton Lumber Co. for pine. Lumber for the long bridges over the Stanislaus and Tuolumne Rivers is included in these contracts.

Santa Clara Valley.—Articles of incorporation of this company were filed at San Francisco last week with a capital stock of \$100,000, of which \$60,000 has been paid in. The promoters of the road, each of whom has subscribed \$10,000, are: R. J. R. Aden, of Vallejo, Cal.; Andrew Rocca, of Napa, Cal.; H. P. Thayer, of San Jose, Cal.; and H. W. Goodall, A. E. Pryor, A. L. Piper and C. A. Shurtleff, of San Francisco. The line will be eight miles long, from San Jose to a point on San Francisco bay, near Alviso, and a line of steamers will run to San Francisco carrying freight and passengers. The road will be standard gage.

Southern Pacific.—Work on the Santa Barbara division is being pushed with renewed vigor, and the line has been completed to Guadalupe, 27 miles south of San Luis Obispo. The completion of the work now under contract will carry the line to within 70 miles of Santa Barbara, the objective point.

The Central Pacific will soon begin the construction of a new branch of its main line to connect Boca, Cal., with the rich timber country about Independence Lake. The forests in the neighborhood of the main line have been cleared off to a distance that makes the haul by team unprofitable, hence the necessity of the new line. The branch will be 18 miles in length, of standard gage. The surveys are now being made.

Terminal Railway of Buffalo.—The contest between this company and the Depew & Southwestern for the

right to construct a railroad from the town of Depew to Blaisdell, a station on the Lake Shore & Michigan Southern southwest of Buffalo, has been carried from the New York Railroad Commissioners to the State Supreme Court at Buffalo. It will be remembered that the two companies were organized within a few days of each other in June last to build over the same route, the Terminal project representing the New York Central interests and the Depew & Southwestern Lehigh Valley interests. When each company appeared before the State Railroad Commissioners asking that the Commissioners grant authority, in accordance with the general railroad law of the state, to construct its road, the Commissioners decided in favor of the Terminal Railway project at the same time giving similar authority to a second line organized by the Lehigh Valley to build to Tonawanda north of Buffalo as no opposition was made to that project. The directors of the Depew & Southwestern have contended that the Commissioners acted without authority in deciding against them, the Southwestern road having been the first to file its charter. They have now begun suit in the Supreme Court to restrain the Terminal from acquiring lands for railroad purposes or from beginning the construction of its road under the certificate of the Railroad Commissioners.

Texarkana & Fort Smith.—The construction work on the extension of this road, which is the Texas Division of the Kansas City, Pittsburg & Gulf, is now making very rapid progress south of Texarkana. Much construction material has been delivered at Texarkana and along the line of the southern extension, and track-laying is making rapid progress toward Shreveport, La. The train service is being extended from time to time as the rails are laid and the roadbed ballasted. The present terminus of passenger train runs is now at the new town of Bloomberg.

Toledo, Ann Harbor & North Michigan.—C. H. Braman & Co., of Toledo, have the contract for building a new line between Ithica and Alma, Mich. This is one of the several new lines building by this company this year to shorten the distance of the present main line across Michigan. Although only five miles long this new line will shorten the present Ann Arbor line between the towns named fully $\frac{1}{2}$ miles. The cut-off at Howell Junction, Mich., the construction of which has been in progress for some weeks, will be ready for traffic shortly. The company is also building a new line between Hamburg and Hamburg Junction, which will give it a line of its own between these two towns, the Grand Trunk tracks having been used heretofore between those two towns.

Tyler Southeastern.—The change in the gage of this track from 3 ft. to standard already mentioned in these columns, has been accomplished and standard gage trains are now running the entire length of the road from the connection with the main line of the St. Louis Southwestern at Tyler to Lufkin, Tex. The line is 50 miles long and is operated as a division of the St. Louis Southwestern.

GENERAL RAILROAD NEWS.

Atlantic & Pacific.—The Frankfort and Amsterdam committees of the bondholders met this week and decided that unless the committees' complaints were settled satisfactorily to again apply for a special receiver on Nov. 1, to press for the foreclosure of the mortgage and to seek to establish connection with other railroads.

Birmingham, Sheffield & Tennessee River.—This road was sold at foreclosure at Sheffield, Ala., Sept. 16, to satisfy a decree in favor of the Knickerbocker Trust Co., of New York. The price paid was \$500,000. The purchasers are J. H. Leper and J. Kennedy Tod, of New York, who represented the bondholders. The road runs through a rich mineral region from Birmingham to Sheffield, in Alabama.

Columbus, Sandusky & Hocking.—This property was sold at Bucyrus, O., under the decree of foreclosure secured by the Bondholders' Committee from the state court, and was purchased for \$4,100,000 by W. E. Guerin, the President for G. W. Sinks, of Columbus, O., and D. B. Hatch, of New York City, representing the committee of bondholders. Mr. Guerin's first bid was for \$1,500,000, and it was expected that the property would be sold at this figure. A higher bid was made, however, and, as stated above, the property was finally sold for \$4,100,000. The confirmation of the sale at that figure was, however, opposed by the Bondholders' Committee on the ground that the other bids made for the property were not bona fide and that the opposing bidder represented no interest financially able to conclude the purchase of the property. The sale was set aside on Sept. 17, and the road ordered sold on Oct. 19.

Great Northern.—Judge Sanborn of the United States Court at St. Paul, has rendered a decision denying the motion restraining the Great Northern road from carrying out the consolidation scheme or the traffic agreement with the Northern Pacific.

Missouri, Kansas and Texas.—The Osage Division of the Missouri Pacific has recently been turned over to the officers of this company, and is now being operated in connection with its Kansas City Division. This line extends from Paola, Kan., near Kansas City, east to Holden, Mo., and is about 54 miles long. The line, though owned by the Missouri, Kansas & Texas, has been operated by the Missouri Pacific. This branch is to form the western section of the new Kansas City and St. Louis line of the Missouri, Kansas & Texas, which is now being completed by the construction of new line between Holden and Sedalia. At the latter town the new branch connects with the Missouri, Kansas & Eastern Division, which extends along the Missouri River into St. Louis. In the latter city the company has obtained the right to run its trains into the new St. Louis Union station.

Nevada Southern.—A decree for the sale of this property at foreclosure has been secured by the judgment creditors, from the Superior Court of California. The sale will probably take place about Oct. 1. The exact date has not yet been announced. The principal creditors of the company are the Atlantic & Pacific Railroad, for \$80,000; the Atchison, Topeka & Santa Fe for \$8,000; Bright & Crandall, the contractors who built nearly all the road, for \$31,000, and other firms who furnished construction supplies. The road was built through San Bernardino County in California in 1893 from a connection with the Atlantic & Pacific to the Vanderbilt gold mines, about 30 miles of the road being completed and in operation. R. S. Seibert is the Receiver. R. W. Woodbury, of Denver, is at present the chief security holder and he is expected to purchase the road at the foreclosure sale. He proposes as soon as the reorganization has been completed, to begin the construction of 45 miles of additional railroad from the

present northern terminus at Manvil, Cal., to the mines at Good Springs in Nevada. These are low grade silver and gold mines and will give the new line a heavy traffic from the beginning. In addition the line will reach large other mineral lands and give access to extensive water supplies in the two valleys which will be crossed.

New York & New England.—The projectors of the new company, which is the successor of the New York & New England, last week had recorded in various counties in Massachusetts and Connecticut the new mortgage for \$17,500,000, of which the Manhattan Trust Co., of New York city, is trustee.

North Carolina.—As we go to press this week a meeting is being held at Greensboro, N. C., of the stockholders of this road for the purpose of approving of the new lease of the road to the Southern Railway, recently made by the board of directors, and also to surrender the exemption, contained in its charter, of the road from state taxation. By the terms of the charter the road is exempted from taxation until it earns more than six per cent. The rental under the old lease was six per cent., and so, of course, no tax was paid on the property. Under the new lease, which goes into effect next January, the road will be subject to taxation, as the rental (6½ per cent. for the next six years and 7 per cent. for the following 93 years of the lease) will exceed 6 per cent. The Governor of North Carolina has for two years been trying to induce the stockholders to surrender the tax exemption of the road, but the private stockholders refused to consent, and although the state owns three-fourths of the \$4,000,000 stock of the road, it was unable to tax the property because of the following by-laws:

"At least 100 individual stockholders, represented either in person or by proxy, and holding not less than a majority of the stock subscribed by individuals, shall be necessary to constitute a quorum for the transaction of business."

The private stockholders for two years have refused to attend the meetings, and so the state's representatives could not secure an opportunity to out-vote them and surrender the exemption, as they desired. As the Southern Railway will now have to pay the taxes for 99 years instead of for only six years longer, as was the case before the re-lease, a majority of the private stockholders will probably not object to the surrender of the exemption at the meeting now being held, though some still oppose it, for the reason that if the Southern should forfeit or surrender the lease, the taxes would have to be paid by them. The lease will be formally ratified without objection, as the private stockholders were consulted before it was made, and all of them readily express their approval of the plan.

Peoria, Decatur & Evansville.—The annual meeting of the stockholders will be held at Evansville, Ind., on Oct. 1 and three members of the Board of Directors will be elected. The road is now in the hands of a receiver, but the property is to be sold at foreclosure shortly under the second mortgage. Many of the large stockholders have approved the reorganization plan of the Second Mortgage Bondholders' Committee, and Work, Strong & Co., of New York, and Kummer & Becker, of Baltimore, representing these stockholders, solicit proxies to be voted at the annual meeting for the election of three directors who will co-operate with the second mortgage bondholders, whose plan, it is believed, will give the most advantageous terms to the stockholders.

Toledo, St. Louis & Kansas City.—Secretary Otto T. Bannard of the first mortgage bondholders' committee announces that nearly \$8,000,000 of the total issue of \$9,000,000 first mortgage bonds have been deposited with the committee. Bonds not deposited in accordance with the agreement with the Continental Trust Company, on or before Oct. 10, will only be received upon payment of a penalty of \$20 a bond.

Washington & Idaho.—The Bay State Trust Company has begun an action in the United States District Court at Spokane, Wash., to foreclose a mortgage of \$4,616,400 against this company, which owns about 155 miles of road in Eastern Washington. It is leased to the Oregon Railway & Navigation Co.

TRAFFIC.

Traffic Notes.

The Boston & Maine recently took into Boston a train of 44 cars of yellow pine flooring, from Mississippi, for a single firm.

The ocean steamship companies have recently advanced the steamer rate from Liverpool to New York about 50 per cent., the new rate being \$26.50.

The Philadelphia & Reading last week put on sale 100-ride tickets between Philadelphia and Trenton, 37 miles, at \$25.80 each, making the cost of a round trip less than one-half the price charged for single tickets, the latter being the only kind heretofore sold. The Pennsylvania at once took similar action.

In Toronto last week, a passenger who offered to sell the return half of an excursion ticket over the Grand Trunk Railway was arrested by a detective of the road, and was imprisoned for 10 days. Judging from the tone of the press dispatch, it would look as though this detective had better pay more attention to scalpers and less to innocent passengers.

The Railroad Commissioners of Mississippi have ordered the Illinois Central to run a morning train to Jackson over the Natchez, Jackson & Columbus Division, but the company has replied that it will refuse obedience to the order, on the ground that the business is not sufficiently large to justify an additional train. The citizens of Jackson petitioned for the train, stating that their county had given \$250,000 toward the construction of the road.

The Central Railroad of Georgia has put on an additional through train between Atlanta and Macon to accommodate the increased travel on account of the Atlanta Exposition. The new train makes the trip of 105 miles in 2 hours 35 minutes, including four stops. The Atlantic Coast Line has put on a sleeping car line between Jersey City, N. J., and Atlanta, to meet the requirements of the Exposition travel. The cars run on trains 32 and 35.

There has been considerable difficulty lately in maintaining the regular Chicago passenger rate out of Columbus, O. This traffic has the choice of five routes, the Pennsylvania, the Big Four, the Baltimore & Ohio, the Columbus, Hocking Valley & Toledo and the Toledo & Ohio Central. It seems the trouble originated with the Ohio Central, which refused to sign the local agreement, and proceeded to advertise a \$5 rate to Chicago and return. This rate was met the following day by other lines with a \$4 rate. At this juncture the general managers stepped in and called a halt. A meeting was

held, and all the roads agreed to restore the regular tariff rate of \$8.35.

The Pennsylvania Railroad, which has recently made a contract with the City of New York for the use of a pier at West Twenty-second street, to which the road will run ferryboats from its Jersey City terminus, announces that when the boats are ready to run, which will be in about four months, the company will have a cheap cab service established in New York similar to that now in effect at Philadelphia. Rates will be in many cases 50 per cent. lower than those now asked by the New York cabmen. Under the pier contract the Pennsylvania pays for the use of the pier \$22,500 a year and 5 per cent. of the gross ferry receipts from passengers starting from the New York side.

It is announced in New York that an agreement has been signed by the Panama Railroad Company and the Pacific Mail Steamship Company, by which the war for business that has been going on for two years or more between the two companies has been ended, and rates will immediately be advanced. The agreement provides that the railroad shall withdraw its boats from the Pacific business and that the steamship company shall withdraw from the Atlantic business. In addition the part of the contract of 1872, providing that the railroad could deal only through the Pacific Mail Company on Central American freight, has been abrogated. The war between the two companies has been severe, resulting in very low rates.

Chicago Traffic Matters.

CHICAGO, Sept. 18, 1895.

Eastbound shipments by rail lines last week show a further increase, and the evenness of the gain as distributed among the standard roads would indicate that they are all maintaining about the same rates. The so-called weak lines are apparently getting business away from the strong lines, which would seem to require some explanation. The increase last week was entirely in grain and millstuffs.

Lake lines scored a slight advance in the grain rate last week, but it was quickly lost, the rate falling back to 2 cents to Buffalo.

The Grand Trunk officials deny that that road has determined to advance the mileage on refrigerator cars in the dressed beef carrying trade from $2\frac{1}{2}$ to $7\frac{1}{2}$ mills a cent a mile.

Central Traffic lines have agreed to again resume pro-rating with Western lines on through transcontinental business via Chicago and St. Louis to Pacific coast points. The arrangement is similar to that which was in effect up to about a year ago, when a controversy arose over a question of divisions which resulted in a cancellation of all pro-rating.

The Lake Michigan Car Ferry Transportation Company's request to the Central Traffic Association for rates and divisions on lumber from Wisconsin points has been referred to the Chicago committee.

All freight rates from Chicago, St. Louis and St. Paul to Montana common points are to be advanced this week, with corresponding advances to Washington points. The advance in the rate from the Missouri River is as follows:

	1.	2.	3.	4.	5.	A.	B.	C.	D.	E.
New rate.....	2.50	2.15	1.75	1.50	1.25	1.15	1.00	.90	.75	.71
Old rate.....	1.85	1.70	1.60	1.40	1.20	1.10	.90	.80	.70	.68

There is some prospect of a restoration of rates to and from Texas points now that the Southwestern Association has agreed to an advance on Sept. 25, but I am inclined to believe, from inside information, that the restoration is likely to be short lived. Some of the Texas roads do not seem to be willing to do business on published rates, but as soon as a rate is published begin to grant secret concessions. Already the Rock Island and the Missouri, Kansas & Texas are involved in a controversy regarding the filing of notices with the Interstate Commerce Commission.

An attempt will be made within the next few days to bring about a settlement of the Texas passenger rate war, with some show of success.

A rumor is current that the Central Traffic and Trunk Line Associations are to be merged. This is improbable, but another attempt will probably be made to make the "Joint Committee" something more than a figure-head. Whenever the situation becomes critical, the Presidents talk about reorganizing the Joint Committee. An attempt was made to do this at the time Aldace F. Walker was elected Chairman, but before the Presidents could decide to agree upon a set of rules which should give this committee sufficient power to arbitrate successfully, they again allowed the committee to lapse into its former state of uselessness, and the members of the committee, having no power to enforce their decisions, soon came to the conclusion that it was a waste of time and money to keep up the farce of holding meetings and maintaining an expensive outfit. If the Eastern roads wish to do so, the Joint Committee can be made a power by providing a permanent board of arbitration, whose decisions shall be final. Until this is done, there will continue to be "arbitration that does not arbitrate."

Central traffic roads have authorized the sale of round-trip season tickets to Atlanta for the Exposition, good from Sept. 15 until Jan. 7, 1896, at 75 per cent. of double first-class limited fare, and excursion tickets limited to 20 days from date of sale at one first-class limited fare plus 10 per cent. Western lines will probably make a one-fare rate up to Central Traffic Association gateways, although some of the roads favor 75 per cent. of double first-class one way rate.

The shipment of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending Sept. 14, amounted to 60,900 tons, against 57,232 tons during the preceding week, an increase of 3,668 tons, and against 51,528 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	WEEK TO SEPT. 14.		WEEK TO SEPT. 7.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central.....	6,196	10.2	6,221	10.9
Wabash.....	6,181	10.1	6,116	10.7
Lake Shore & Mich. South.	7,864	12.9	7,034	12.3
Pitts., Ft. Wayne & Chicago	7,693	12.6	7,736	13.5
Pitts., Cin., Chi. & St. Louis.	7,848	12.9	7,693	13.4
Baltimore & Ohio.....	3,374	5.5	3,635	6.4
Chicago & Grand Trunk.....	9,052	14.9	7,782	13.5
New York, Chic. & St. Louis	4,482	7.4	3,575	6.2
Chicago & Erie.....	6,003	9.8	5,211	9.1
C., C., C. & St. Louis.....	2,237	3.7	2,229	4.0
Total.....	60,900	100.0	57,232	100.0

Of the above shipments 1,552 tons were flour, 23,715 tons grain and mill stuff, 11,181 tons cured meats, 10,047 tons dressed beef, 1,567 tons butter, 1,774 tons hides, and 5,334 tons lumber.